

## **Using Environmental Print to Enhance Emergent Literacy**

### Author

Neumann, Michelle Margaret

### Published

2012

### Thesis Type

Thesis (PhD Doctorate)

### School

School of Applied Psychology

### DOI

[10.25904/1912/2409](https://doi.org/10.25904/1912/2409)

### Rights statement

The author owns the copyright in this thesis, unless stated otherwise.

### Downloaded from

<http://hdl.handle.net/10072/367226>

### Griffith Research Online

<https://research-repository.griffith.edu.au>

# Using Environmental Print to Enhance Emergent Literacy

Michelle Margaret Neumann

BSc (Hons), BEd, PGDE

School of Applied Psychology

Griffith Health

Griffith University

Submitted in fulfilment of the requirements of the degree of

Doctor of Philosophy

October 2011

## Abstract

Environmental print in the form of product labels and signs provides children with their earliest print experiences. The present research examined the role of environmental print in early reading and writing development and the ways in which parents and early childhood educators can best utilise it to foster emergent literacy and print motivation. This involved (a) case study and observational methods to document how parents naturally use environmental print in the home and during play to scaffold children's emergent literacy and print motivation and (b) experimental methods to evaluate the effects of directly using environmental print to scaffold emergent literacy and print motivation in a preschool setting. The case studies provided a detailed view of how a mother referenced environmental print words and letters using multisensory strategies and how children utilised these environmental print strategies during print interactions. A larger sample of mother-child dyads ( $N = 35$ ;  $M$  age child = 4.30 years) were observed at play in a grocery shop setting and during a joint writing activity in this same setting. Two-thirds of mothers referred to environmental print words during play. However, only a small number of mothers referred to letters in the environmental print during play or used it during the joint writing to scaffold their child's writing. When referring to environmental print, the mothers used strategies such as encouraging their child to identify letters embedded in the print by names and sounds, using directional and descriptive language to describe letter shapes, and copying the environmental print. Some mothers traced print with fingers and formed letter shapes in the air. Thus, similarly to the mother in the case studies, these mothers used multisensory strategies to engage their child with the print. Maternal environmental print referencing also correlated positively with children's letter and name writing and print

concepts. These observational data provide evidence of the positive role that environmental print played in emergent literacy development.

To directly test the effects of using environmental print on emergent literacy development (letter name and sound knowledge, letter writing, print concepts, and environmental print and standard print word reading) and print motivation, a controlled randomised 8-week intervention study was conducted in preschool settings ( $N = 73$ ;  $M$  age = 4.12 years). The use of environmental print and standard print (same words printed in black manuscript form on white cards) were compared to a no-intervention control group. The environmental print and standard print interventions used the same program activities except the print type differed with the environmental print group using environmental print words in context (e.g., on a cereal box). Similar multisensory strategies to those observed in the initial case and observational studies were incorporated into the intervention. Groups were assessed pre-intervention at which point they did not differ on emergent literacy or print motivation. They were reassessed immediately post-intervention and 2-months later. At the post-assessments, the environmental print group outperformed the control group on all measures (letter sound knowledge, letter writing, print concepts, standard print and environmental print reading, and print motivation) except letter name knowledge. The standard print group outperformed the control on letter writing and standard print word reading at post-test only. The environmental print group also outperformed the standard print group on print motivation, environmental print reading, and letter writing. This provides empirical evidence that using environmental print can effectively enhance emergent literacy in preschool settings and, in several cases, more effectively than using standard print. The adult scaffolding of interactions with environmental print combined

with the ubiquitous nature of this print may have provided further opportunities for children to initiate their own learning through the exploration of it in their broader contexts. Thus, environmental print provides an important and readily available tool for early literacy development.

## **Statement of Originality**

*This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.*

(Signed)

Name of Student: Michelle Neumann

## **Acknowledgments**

Firstly I would like to thank God for his amazing blessings each day. I am eternally grateful to my wonderful husband David and five beautiful children Alexandria, Jessica, William, Anastasia, and Jack for their patience and support over the course of my PhD. To my Mum, Dad, family and friends thank you for believing in me. Many thanks are given to Dr Michelle Hood, Dr Ruth Ford, and Emeritus Professor Merv Hyde for their advice, guidance, and supervision during my candidature. Thank you to Rebecca Dale for her inter-rater assistance. Finally, I would like to give a special thank you to all the children, parents, and staff from the local childcare centres for their willingness to participate in this research.

## Table of Contents

<b>Abstract.....</b>	ii
<b>Statement of Originality.....</b>	v
<b>Acknowledgements.....</b>	vi
<b>Acknowledgments of Published Chapters.....</b>	xv
<b>Chapter 1. General Introduction.....</b>	1
Models of Reading Development.....	2
Environmental Print in Emergent Literacy.....	5
Longitudinal Case Studies 1 and 2.....	9
Naturalistic Observational Studies 3 and 4.....	11
Intervention Study 5.....	15
Summary of the Research.....	19
Thesis Outline.....	20
References.....	28
<b>Chapter 2. The Role of Environmental Print in Emergent Literacy.....</b>	39
Prelude.....	39
Abstract.....	42
Introduction.....	43
The Emergence of Environmental Print Knowledge.....	46
Environmental Print and Models of Reading Acquisition.....	49
The Relationship Between Environmental Print Reading and Emergent Literacy Skills.....	54
Using Environmental Print to Scaffold Emergent Literacy Skills.....	58
Conceptualising the Role of Environmental Print in Literacy Learning: Summary and Directions for Future Research.....	68
Conclusion.....	73
References.....	75



<b>Chapter 3. The Scaffolding of Emergent Literacy Skills in the Home</b>	
<b>Environment: A Case Study (Study 1).....</b>	<b>86</b>
Prelude.....	86
Abstract.....	90
Introduction.....	91
Description of Child.....	93
Parent-child Interactions and Strategies.....	93
Discussion.....	103
References.....	107
<b>Chapter 4. Parental Strategies to Scaffold Emergent Writing Skills in the</b>	
<b>Preschool Child within the Home Environment (Study 2).....</b>	
Prelude.....	110
Abstract.....	113
Introduction.....	114
Description of Child.....	117
Data Collection.....	117
Observations and Writing Samples.....	118
Discussion.....	133
References.....	136
<b>Chapter 5. Mother-Child Referencing of Environmental Print and its</b>	
<b>Relationship with Emergent Literacy Skills and Home Literacy (Study 3)...</b>	
Prelude.....	140
Abstract.....	145
Introduction.....	146
Method.....	152
Results.....	161
Discussion.....	176

Conclusion.....	186
References.....	187
<b>Chapter 6. Mother-child Joint Writing in an Environmental Print Setting: Relations with Emergent Literacy (Study 4).....</b>	<b>195</b>
Prelude.....	195
Abstract.....	199
Introduction.....	200
Method.....	205
Results.....	212
Discussion.....	224
Conclusion.....	230
References.....	231
<b>Chapter 7. Multisensory Methods for Early Literacy Learning.....</b>	<b>239</b>
Prelude.....	239
Abstract.....	243
Introduction.....	244
The Neurophysiological Basis of Multisensory Processing.....	245
The Importance of Early Experience in the Development of Multisensory Processing.....	249
A Historical Perspective on Multisensory Methods.....	252
A Review of Multisensory Early Literacy Studies.....	255
Applications.....	262
Suggestions for Future Research.....	265
Conclusion.....	266
References.....	267

<b>Chapter 8. Using Environmental Print to Enhance Emergent Literacy and Print Motivation (Study 5).....</b>	<b>279</b>
Prelude.....	279
Abstract.....	284
Introduction.....	285
Method.....	295
Results.....	306
Discussion.....	318
References.....	329
<b>Chapter 9. General Discussion.....</b>	<b>342</b>
Summary of Main Findings.....	342
Environmental Print and Reading Development.....	354
Environmental Print and Writing Development.....	359
Practical Implications and Future Research.....	361
Conclusion.....	366
References.....	367

## List of Tables

<b>Table 5.1</b> Types of Environmental Print Referenced.....	162
<b>Table 5.2</b> Descriptive Statistics for Environmental Print Referencing, Emergent Literacy, Home Literacy, and Demographic Factors.....	172
<b>Table 5.3</b> Partial Correlations Between Maternal Environmental Print Referencing in the Play Setting, Emergent Literacy, and Home Literacy Practices with Child Age Partialled Out.....	174
<b>Table 5.4</b> Descriptive Statistics of Children who did and did not Reference Environmental Print.....	175
<b>Table 6.1</b> Print Mediation Scale.....	209
<b>Table 6.2</b> Grapho-phonemic Mediation Scale.....	209
<b>Table 6.3</b> Percent of Mothers in Each Print Mediation Behaviour.....	214
<b>Table 6.4</b> Percent of Mothers in Each Grapho-phonemic Mediation Behaviour..	216
<b>Table 6.5</b> Descriptive Statistics for Maternal Mediation and Child Emergent Literacy Skills.....	217
<b>Table 6.6</b> Partial Correlations Between Maternal Print and Grapho-phonemic Mediation and Emergent Literacy Skills, Controlling for Age.....	219
<b>Table 8.1</b> Means, Standard Deviations, and Range for the Two Intervention and Control Groups in all Measures.....	307
<b>Table 8.2</b> Frequency Distribution Table of Letter Sound Knowledge Across the Groups Prior to the Intervention.....	308
<b>Table 8.3</b> One-way ANOVA Pre-tests of Environmental Print, Standard Print, and Control Groups.....	309

## List of Figures

<b>Figure 2.1</b> The Role of Environmental Print in the Acquisition of Logographic and Emergent Literacy Skills.....	45
<b>Figure 3.1</b> Examples of Harry’s Writing Development.....	99
<b>Figure 3.2</b> Child-initiated Writing of Environmental Print.....	103
<b>Figure 4.1</b> Roseanna’s Drawing of a Sun.....	121
<b>Figure 4.2</b> Roseanna’s Scribbles and Letter Formation.....	122
<b>Figure 4.3</b> Roseanna’s Writing in the Pre-alphabetic Phase.....	124
<b>Figure 4.4</b> Parent Scaffolding Roseanna’s Writing of ‘Scooby Doo’.....	125
<b>Figure 4.5</b> Roseanna’s Writing Using Environmental Print.....	126
<b>Figure 4.6</b> Roseanna’s Writing Using Environmental Print Labelled Products...	128
<b>Figure 4.7</b> Roseanna’s Story Writing with Parent Scaffolding of Letter Formation.....	130
<b>Figure 4.8</b> Roseanna’s Story Writing Using Scaffolded Lines.....	131
<b>Figure 5.1</b> The Grocery Shop Play Setting.....	155
<b>Figure 6.1</b> Children’s Writing Samples Where Mothers Used Environmental Print to Scaffold Their Child’s Writing.....	223
<b>Figure 8.1</b> An Example of the Print Types Used for Each Intervention Group....	303
<b>Figure 8.2</b> Mean Letter Name Knowledge for Environmental Print, Standard Print and Control Group at Pre-intervention, Post-Intervention, and Two Months Follow-up.....	311
<b>Figure 8.3</b> Mean Letter Sound Knowledge for Environmental Print, Standard Print, and Control Group at Pre-intervention, Post-Intervention and Two Months Follow-up.....	313

<b>Figure 8.4</b> Mean Letter Writing for Environmental Print, Standard Print, and Control Group at Pre-intervention, Post-Intervention and Two Months Follow-up.....	314
<b>Figure 8.5</b> Mean Print Concepts for Environmental Print, Standard Print, and Control Group at Pre-intervention, Post-Intervention and Two Months Follow-up.....	315
<b>Figure 8.6</b> Mean Print Motivation for Environmental Print, Standard Print, and Control Group at Pre-intervention, Post-Intervention and Two Months Follow-up.....	316
<b>Figure 8.7</b> Mean Environmental Print Reading for Environmental Print, Standard Print, and Control Group at Pre-intervention, Post-Intervention and Two Months Follow-up.....	317
<b>Figure 8.8</b> Mean Standard Print Reading for Environmental Print, Standard Print, and Control Group at Pre-intervention, Post-Intervention and Two Months Follow-up.....	318
<b>Figure 9.1</b> The Role of Environmental Print in Reading Development (Environmental Print Model).....	355

## List of Appendices

<b>Appendix A</b> - Ethics Clearance.....	373
<b>Appendix B</b> - Name Writing Scale.....	374
<b>Appendix C</b> - Percentage of Mothers Indicating Recognition for Children's Book Titles.....	375
<b>Appendix D</b> - Home Literacy Questionnaire.....	376
<b>Appendix E</b> - Environmental Print Intervention Program.....	382
<b>Appendix F</b> - Fidelity Coding Criteria.....	388

## **Acknowledgement of published and in press papers/book chapter included in this thesis**

*Section 9.1 of the Griffith University Code for the Responsible Conduct of Research (“Criteria for Authorship”), in accordance with Section 5 of the Australian Code for the Responsible Conduct of Research, states:*

*To be named as an author, a researcher must have made a substantial scholarly contribution to the creative or scholarly work that constitutes the research output, and be able to take public responsibility for at least that part of the work they contributed. Attribution of authorship depends to some extent on the discipline and publisher policies, but in all cases, authorship must be based on substantial contributions in a combination of one or more of:*

- *conception and design of the research project*
- *analysis and interpretation of research data*
- *drafting or making significant parts of the creative or scholarly work or critically revising it so as to contribute significantly to the final output.*

*Section 9.3 of the Griffith University Code (“Responsibilities of Researchers”), in accordance with Section 5 of the Australian Code, states:*

*Researchers are expected to:*

- *Offer authorship to all people, including research trainees, who meet the criteria for authorship listed above, but only those people.*
- *accept or decline offers of authorship promptly in writing.*
- *Include in the list of authors only those who have accepted authorship*
- *Appoint one author to be the executive author to record authorship and manage correspondence about the work with the publisher and other interested parties.*
- *Acknowledge all those who have contributed to the research, facilities or materials but who do not qualify as authors, such as research assistants, technical staff, and advisors on cultural or community knowledge. Obtain written consent to name individuals.*

Included in this thesis are published/in press papers and a book chapter/ and papers under review (*Chapters 2, 3, 4, 5, 6, 7, and 8*) which are co-authored with other researchers. My contribution to each co-authored paper is outlined at the front of each relevant chapter. (For Ethics Clearance details see Appendix A). The bibliographic details for these papers are:



**Chapter 2:** Neumann, M. M., Hood, M., Ford, R., & Neumann, D. L. (in press). The role of environmental print in emergent literacy. *Journal of Early Childhood Literacy*.

**Chapter 3:** Neumann, M. M., Hood, M., & Neumann, D. L. (2009). The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal*, 36, 313-319.

**Chapter 4:** Neumann, M. M., & Neumann, D. L. (2010). Parental strategies to scaffold emergent writing skills in the preschool child within the home environment. *Early Years: An International Journal of Research and Development*, 30, 79-94.

**Chapter 5:** Neumann, M. M., Hood, M., & Ford, R. (under review). Mother-child referencing of environmental print: relations with emergent literacy skills and home literacy.

**Chapter 6:** Neumann, M. M., Hood, M., & Ford, R. (2011). Mother-child joint writing in an environmental print setting: relations with emergent literacy. *Early Child Development and Care*, DOI: 10.1080/03004430.2011.615928.

**Chapter 7:** Neumann, M. M., Hyde, M., Neumann, D. L., Hood, M., & Ford, R. (in press). Multisensory methods for early literacy learning. Edited book *Beyond the Lab: Applications of Cognitive Research in Memory and Learning*.

**Chapter 8:** Neumann, M. M., Hood, M., & Ford, R. (under review) Using environmental print to enhance emergent literacy and print motivation.

Appropriate acknowledgements of those who contributed to the research but did not qualify as authors are included in each published paper.

(Signed)

Name of Student: Michelle Neumann

(Countersigned)

Name of Supervisor: Michelle Hood

## Chapter 1

### General Introduction

“The significance of the years prior-to-school cannot be underestimated in providing exposure to literacy and the development of pre-literacy skills through families, childcare, preschool and community experiences” (Australian Government, 2005 p. 39).

Emergent literacy develops from birth when infants begin their visual exploration of surrounding print (Goodman, 1986; Harste, Woodward, & Burke, 1984). Development of emergent literacy skills is important in the preschool years as they influence future reading and writing ability (Adams, 1990; Australian Government, 2005; Snow, Burns, & Griffin, 1998). The emergent literacy skills young children need to acquire in order to become successful readers include print concepts (Clay, 1998; Justice & Ezell, 2001; Lomax & McGee, 1987), alphabet knowledge (letter sounds and names; Bowman & Treiman, 2004; Foulon, 2005; Levin, Shatil-Carmon, & Asif-Rave, 2006), phonological awareness (Byrne & Fielding-Barnsley, 1989; Mann & Foy, 2003), and emergent writing (Aram & Biron, 2004; Welsch, Sullivan, & Justice, 2003). These are foundational skills upon which children build conventional literacy skills (independent and fluent word reading and writing), with alphabet knowledge and phonological awareness being the strongest predictors of future word reading ability (Adams, 1990; Blair & Savage, 2006; Ehri & Roberts, 2006; Foulon, 2005; Molfese, Beswick, Molnar, & Jacobi-Vessels, 2006). In addition, print motivation can be fostered prior to school-entry and influences future

literacy skill acquisition (Baker, Scher, & Mackler, 1997). Print motivation refers to a young child's relative interest in literacy activities (Whitehurst & Lonigan, 1998).

Emergent literacy skills are influenced by socio-cultural factors including people (e.g., parents/adults) and materials, including books and surrounding print (Bodrova & Leong, 2007; McNaughton, 1995; Neuman & Roskos, 1997; Vukelich, 1994). Vygotsky's (1978) socio-cultural perspective provides a relevant theoretical framework within which to view parent/adult-child literacy interactions with print. Within each literacy interaction, parents/adults can provide enough guided participation as necessary to scaffold the child's movement within their Zone of Proximal Development, which is the space between a child's level of mastery with and without assistance. *Scaffolding* refers to the process of using tools or techniques to allow a child to achieve a goal that would otherwise be beyond his or her unassisted efforts (Wood, Bruner, & Ross, 1976). These supportive learning tools such as dictating spellings (DeBaryshe, Buell, & Binder, 1996) are gradually removed as the child gains mastery of a task. Through socio-cultural interactions with print including that in the surrounding environment and explicit guidance by a parent or adult, children can develop these foundational emergent literacy skills (Enz, Prior, Gerard, & Han, 2008; McGee & Richgels, 1989; Richgels, Poremba, & McGee, 1996).

### **Models of Reading Development**

A generally accepted model of early reading acquisition has been developed by Ehri (1995). It begins with the pre-alphabetic phase where children use salient cues to recognize print and know some letter names. During the pre-alphabetic phase, knowledge about surrounding print emerges through socio-cultural experiences with it and connections are

made between visual features/contextual cues and their pronunciation or semantic representation (Ehri, 1995, 2005; Ehri & McCormick, 1998). Frith (1985) referred to this ability to identify surrounding or environmental print as logographic reading.

Ehri (2005) and others (e.g., Masonheimer, Drum, & Ehri, 1984) do not consider logographic reading to be an actual stage of reading development because children rely on visual contextual cues rather than letter-sound analysis skills to decode print. This is supported by studies showing that logographic readers can no longer read these environmental print words such as signs and labels when they are presented in standard black and white manuscript form following removal of their contextual cues such as colours and logos (Cloer, Aldridge, & Dean, 1981/1982; Goodall, 1984; Hiebert, 1978; Masonheimer et al., 1984; Sonnenschein & Munsterman, 2002). Similarly, correlational studies have found that logographic reading is a poor predictor of word reading ability because young children rely on the contextual cues in which the print is embedded to interpret it and do not notice the print or decontextualize the letters (Cloer et al., 1981/1982; Goodall, 1984; Masonheimer et al., 1984; Treiman, Cohen, Mulqueeny, Kessler, & Schechtman, 2007). It is suggested that the bright colours and logos distract children from examining the print itself and, therefore, ability to identify environmental print does little to promote early reading skills (Ehri, 2005; Ehri & Roberts, 2006; Masonheimer et al., 1984).

However, Lomax and McGee (1987) found a positive relationship between logographic reading and emergent literacy skills (print concepts, phoneme awareness, letter name, shape and sound knowledge) in children aged 3 to 6 years. McGee, Lomax, and Head (1988) also showed that 3- to 4-year-old non-readers (unable to read basic words in isolation) who could read environmental print in context were aware that it consisted of

letters by being able to identify those letters. This is in contrast with the results of Masonheimer et al. (1984), which suggested that non-readers are insensitive to letter details in environmental print. Other evidence that logographic reading might be related to subsequent reading comes from Cronin, Farrell, and Delaney (1999). They found that non-reading 4- to 5-year-olds could learn to read environmental print words in standard print more efficiently if they could already recognize the environmental print word in context. Therefore, it was argued that the ability to identify environmental print could be considered the first stage of reading.

This pre-alphabetic or logographic phase is followed by the partial alphabetic phase (Ehri, 1995). In this phase, children use some letter sounds to decode print; for example, initial and final letters. This is what is generally considered the first phase of actual reading (Ehri, 2005). The next phase is the full alphabetic phase in which children have mastered letter names and sounds and use sequential phonological decoding of words. The final, consolidated phase occurs when children fuse both orthographic and phonological skills to fluently read words.

Thus, although some doubt exists as to whether logographic reading of environmental print is relevant in the development of reading acquisition (Ehri, 2005; Masonheimer et al., 1984), some studies have shown that logographic reading may contribute to emergent literacy (Lomax & McGee, 1987; Cronin et al., 1999). Furthermore, it is possible that if young children are guided to attend to the letters and words embedded in environmental print through scaffolding by parents or adults during the pre-alphabetic phase, emergent literacy may be fostered (McGee & Richgels, 1989; Prior, 2003; Vukelich, Christie, & Enz, 2008).

## **Environmental Print in Emergent Literacy**

In the preschool years, children are not only exposed to print through storybooks (e.g., Justice & Ezell, 2002) but also through environmental print (Kuby, Goodstadt-Killoran, Aldridge, & Kirkland, 1999; Mason, 1980; McGee & Richgels, 1989; Vera, 2007; Yannicopoulou, 2006). Environmental print is surrounding non-continuous print in context that fulfils real-life functions (Adams, 1990; Hall, 1987; Kassow, 2006; Vukelich et al., 2008). Examples of environmental print include labels on food and toy packaging and road signs (Hall, 1987; Horner, 2005; Nutbrown, Hanon, & Morgan, 2005; Vukelich et al., 2008). In context, this type of print appears in a variety of fonts, shapes, sizes, and generally in upper case (Adams, 1990).

Various methodological approaches have been used to study the experiences of young children with environmental print and the relationship of that to emergent literacy. Case studies have provided evidence of child interactions with this type of print in the home setting (e.g., Baghban, 1984; Lass, 1982; McGee & Richgels, 1989; Sinclair & Golan, 2002). For example, a scaffolded interaction with environmental print, specifically a store sign, was described by McGee and Richgels (1989). A father pointed out the letter K in Kmart to his 3-year-old daughter several times as they drove past the Kmart store. Following this repeated and guided interaction, his daughter began to initiate her own interactions with the print by identifying it saying “I see a K, just like Kristen”. These meaningful parent-child interactions with environmental print, led the child to independently identify the letter K. Vignettes have also described environmental print use in the preschool setting (e.g., Enz et al., 2008; Richgels et al., 1996). For example, Enz et al. (2008) described how a preschool teacher used the highly motivating and visually

appealing toy label 'Pokemon' to scaffold children's learning of the letter P. They argued that adults play an important role in guiding young children's interactions with environmental print by drawing their attention to the letters and sounds embedded in environmental print words.

Quasi-experimental intervention studies also provide evidence that children can learn to separate letters from their non-print context through repeated exposure to environmental print (Prior, 2003; Salewski, 1995; Vera, 2007; Wepner, 1985). For example, Prior (2003) conducted a 12-week quasi-experimental pre-post test intervention study ( $N = 107$ ) that examined the effect of using environmental print to facilitate letter name and sound knowledge and environmental print reading ability in kindergarteners in full day classes at primary school (mean age was not provided). There were two treatment groups and one control group. Details were not provided on session duration or specific letters taught. Children's regular teachers provided direct instruction in environmental print that involved teacher discussion around logos (e.g., product or restaurant labels), pointing out letters and sounds in logo words, logo games (e.g., classifying logos) and making logo books where children select logos, glued them in their books and wrote a sentence (e.g., "Mum took me to McDonalds"). The second treatment group involved indirect instruction where children played logo games (e.g., matching a beginning letter to a logo word) with minimal teacher supervision. Children in the control group classes were not systematically or intentionally exposed to environmental print; however, they were highly academic classes with a great deal of teacher attention on learning of letter names and sounds.

The results showed that environmental print reading ability significantly improved in both treatment groups from pre- to post test compared with the control. This led Prior to

conclude that instruction with environmental print helps children notice that logos contain letters and words. There was no difference between the three groups on letter name or sound knowledge however, children at the lower SES school showed significant gains in sound knowledge. As the majority of students in each of the classes knew many of their letter sounds at pre-test and most at post-test, it was difficult to evaluate the effects of using environmental print on letter knowledge. Furthermore, as participants were not randomly assigned to groups the effects of environmental print on letter knowledge remain unclear and require further examination.

Similarly, Vera (2007) also examined the use of environmental print using a quasi-experimental design to enhance some aspects of emergent literacy (alphabet knowledge and print concepts) during a 9-week intervention within a pre-kindergarten literacy curriculum for 4-year-olds ( $N = 56$ ). Thus, this was of shorter duration, used a smaller sample than Prior (2003) and with younger children. The environmental print group used popular culture environmental print logos familiar to the children (e.g., from cartoon/TV/movie characters, toys) to learn about alphabet letters whereas the control group used children's names, calendars, and alphabet books. Both groups were instructed with a similar daily program using storybooks to learn about print concepts. Following the intervention, alphabet knowledge and print concepts were significantly higher in the environmental print intervention group than the control group. Thus, Vera found improvements in alphabet knowledge whereas Prior (2003) did not. This difference may have been due to the older age of children in Prior's study where letter knowledge was near ceiling. In contrast, Vera's participants were younger with lower letter knowledge at pre-test.



These intervention studies were somewhat limited in scope as they only measured a narrow range of emergent literacy skills (i.e., print concepts, alphabet knowledge, and logographic/word reading) and did not conduct follow-up testing to determine the sustainability of children's literacy gains. The majority did not randomly assign children to groups nor did they account for differences in home literacy practices to ensure similar literacy experiences across groups. The intervention programs also included book-making activities and storybook reading so the effects of using environmental print alone on the children's emergent literacy are not clear.

As already described, there is some preliminary evidence that environmental print recognition is related to emergent literacy skills (Lomax & McGee, 1987) and the speed with which children can learn to read those words in conventional print (Cronin et al., 1999). There is also evidence that utilizing environmental print could benefit emergent literacy development prior to school entry (e.g., Vera, 2007; Wepner, 1985). However, further work is required to clarify the role of environmental print in emergent literacy. Therefore, the three guiding research questions of this thesis are: (1) Do parents naturally use environmental print to scaffold their preschool-aged child's emergent literacy, and if so, how? (2) How is environmental print use related to emergent literacy? (3) Can environmental print be used to enhance a range of emergent literacy skills in 3- to 4-year-old preschool children? These questions were investigated using (1) longitudinal case studies describing maternal use of environmental print to scaffold children's emergent literacy (Studies 1 & 2), (2) observational studies of a broader sample of mothers to determine generality of this use and its relationship with emergent literacy (Studies 3 & 4), and (3) a randomized control intervention study in which the use of environmental print

was contrasted with the use of standard print in fostering emergent literacy and print motivation in a preschool setting (Study 5).

### **Longitudinal Case Studies 1 and 2**

Previous case studies have described young children's natural interactions with environmental print (e.g., Baghban, 1984; Lass, 1982; Lujan & Wooden, 1984; McGee & Richgels, 1989; Sinclair & Golan, 2002). For example, Lujan and Wooden observed two toddlers (17 and 18 months) who, following presentations of food-related environmental print items (e.g., Doritos bag, Hershey's wrapper) in context, responded by looking at the environmental print, verbally labelling the item, pointing at the label, and reaching for and visually focusing on the stimulus. Sinclair and Golan (2002) described how 2-year-old 'Luc' explored and attended to print in his environment such as supermarket signs and food product labels. Lass (1982) observed how her 2-year-old son identified letters on signs and store names as they walked together along commercial streets. Similarly, Baghban (1984) noted her 2-year-old daughter's attempts to write meaningful logos such as McDonalds. However, these case studies did not describe what parents were doing to scaffold these print interactions. Indeed, McGee and Richgels (1989) pointed out that these studies lacked details about the specific role that parents played in these interactions such as capturing the child's interest, providing opportunities, and extending interactions with environmental print so that their child acquires new knowledge. Furthermore, as these studies focused on 2-year-olds, there is a lack of information on how environmental print might be used by older preschoolers who show more developed emergent literacy skills such as using letters, matching letters to sounds, and demonstrating linearity and directionality during writing attempts.

Therefore, due to the limited descriptions on parent use of environmental print to scaffold emergent literacy in the home and descriptions beyond 2 years of age, the author based two case studies on longitudinal observational of and qualitative data from her own children's guided interactions with environmental print collected prior to the commencement of the PhD. This archival data was used for these initial case studies to demonstrate parent use of environmental print in the home environment to support children's emergent literacy development.

Study 1 provided a detailed description of parent and child interactions with environmental print from 2 years of age until the child began school at 6 years (Neumann, Hood, & Neumann, 2009). The mother recorded notes of parent-child dialogue during spontaneous environmental print interactions and collected her son's writing samples over this 4-year period. The selected descriptions were indicative of the general nature of these environmental print interactions and focused on the scaffolding the mother used to guide the child's learning about print. Letter name and sound knowledge was also assessed yearly from 3 to 6 years of age.

Study 2 provided detailed descriptions of mother-child joint writing interactions elicited by environmental print over a 2-year period when the daughter was 3 to 4 years of age (Neumann & Neumann, 2010). The mother recorded notes of joint writing interactions with environmental print including descriptions of the writing tasks the mother and child were engaged in, objects used, behaviour, and dialogue that occurred around the interaction. In addition, 40 writing samples were collected; however, due to the spontaneous nature of the joint writing activities it was not always possible to record details associated with every sample.

These case studies extended previous studies (e.g., Lass, 1982; Lujan & Wooden, 1984; Sinclair & Golan, 2002) by providing detailed descriptions of how environmental print was used in the home setting to scaffold the development of older preschooler's letter knowledge, early writing, and print motivation. An obvious limitation of case studies, however, is that the findings (e.g., scaffolding strategies, emergent literacy outcomes) might not generalize to other mother-child dyads. Therefore, it was judged important to observe mother-child interactions with environmental print in a larger sample to determine the extent to which mothers in general use environmental print to scaffold their child's emergent literacy, the types of strategies they use, and the relationships with the child's emergent literacy skills.

#### **Naturalistic Observational Studies 3 and 4**

Parents self-report that they point out and read environmental print to their children (Lynch, 2008). They read common environmental print words (e.g., product labels, signs) to their children during everyday experiences (Mason, 1980; Purcell-Gates, 1996; Teale, 1986). Observational studies have reported on general family literacy interactions in the home (Purcell-Gates, 1996; Teale, 1986) and shown that the most frequent print interactions occurred around entertainment activities (e.g., TV guides) followed by reading labels on products (e.g., cereal boxes, milk cartons). However, no studies to date have specifically examined a larger sample of mothers and their children to determine the extent to which they spontaneously refer to environmental print when surrounded by it, how they use it to scaffold children's literacy learning, and how that is related to emergent literacy skills, including writing.

Observation in naturalistic settings is a more ecologically valid measure of what parents and children actually do with environmental print than self-report questionnaires, which are subject to social desirability (Dodici, Draper, & Peterson, 2003). Therefore, Studies 3 and 4 involved naturalistic observation and video recording of mother-child dyads ( $N = 35$ ) in an environmental print-rich grocery shop play setting. The grocery shop play setting included environmental print on products (grocery items with salient print on labels, e.g., CORNFLAKES), signs (e.g., OPEN, CLOSED), and a toy cash register. Children were aged 3 to 4 years and were non-readers. Mothers were not aware that their interactions with environmental print were being observed.

These studies were designed to describe mother-child's interactions with environmental print in two ways. First, Study 3 examined the extent to which mothers and children naturally referred to environmental print in the play setting and whether this was related to children's emergent literacy. Second, Study 4 examined mothers' natural use of environmental print to scaffold their child's writing during a prompted joint writing activity and whether the level of maternal mediation in the joint-writing task was related to children's emergent literacy.

Specifically, the first aim of Study 3 was to describe the quantity and nature of environmental print interactions initiated by mother or child during a 15-minute play session in the grocery shop setting. Mother and child verbal and non-verbal referencing of environmental print was coded to quantify the frequency of interactions with environmental print words and letters embedded within these words based on a scoring system adapted from Justice and Ezell (2000) and Neuman and Roskos (1993). The second aim was to determine whether the number of references to environmental print made during the play

was related to children's emergent literacy skills and print motivation. The emergent literacy skills were print concepts (Clay's, 2005; Concepts About Print), alphabet knowledge (letter names and sounds), phonological awareness (initial and final phoneme awareness, rhyme awareness); letter writing, name writing, environmental print reading in context and in standard print, and print motivation (adapted from Baker & Scher's, 2002, Motivations for Reading Scale). If using environmental print fosters emergent literacy (e.g., Enz et al., 2008; Richgels et al, 1996), it was hypothesized that mothers who pointed out and utilized environmental print in the play setting more frequently would have children with more highly developed emergent literacy skills and print motivation.

The third aim was to determine the relationship between self-reported frequency of environmental print use at home and observed use in the play setting. Mothers completed a self-report home literacy questionnaire (adapted from Hood, Conlon, & Andrews, 2008), which included questions about the frequency of mother and child home use of environmental print as well as demographic details (e.g., parental education level and occupation, child age and gender) and other home literacy activities (e.g., storybook reading, letter teaching). If there is consistency in maternal use of environmental print across settings and if self-report questionnaires are valid measures of these behaviours, it was hypothesized that there would be a positive correlation between self-reported and observed environmental print referencing behaviours. In addition, the relationship between environmental print referencing in the play setting and broader home literacy activities such as storybook reading and maternal literacy teaching was examined.

Study 4 examined parent use of environmental print to scaffold children's writing. Parents play an important role in scaffolding their children's early writing development by

providing writing materials and opportunities to use them, giving feedback about writing attempts, and extending and clarifying writing interactions (Aram, 2002; Aram & Levin, 2001, 2002; Burns & Casbergue, 1992; DeBaryshe, Buell, & Binder, 1996; Green, 1987; Stellakis & Kondyli, 2004; Yang & Noel, 2006). Studies have also investigated the general strategies parents use to scaffold word writing (Aram & Levin, 2001, 2002; Aram, 2002; Burns & Casbergue, 1992; DeBaryshe et al., 1996; Sarracho, 1997). These include the parent holding and leading the child's hand to write the words (Aram, 2002; Aram & Levin, 2002), writing a word and encouraging the child to copy it (Aram, 2002; Aram & Levin, 2002), and dictating the names and sounds of letters for the child to write the word (Aram & Levin, 2002; Burns & Casbergue, 1992; DeBaryshe et al, 1996; Green, 1987). However, little research exists on how mothers might use environmental print to scaffold joint writing. For example, although Baghban (1984) reported in her case study that her 2-year-old daughter 'Giti' attempted to write environmental print words such as McDonalds, detail was lacking about how the mother scaffolded her child's writing.

Therefore, the first aim of Study 4 was to determine whether mothers spontaneously use environmental print to scaffold and mediate their children's letter and word writing during a joint writing task within an environmental print rich setting, and, if so, to describe how they do this. At the end of the 15-minute play session (Study 3), the mother and child were asked to sit at the table in the grocery shop play setting and complete a writing task. The mother was instructed to help her child write a shopping list that included the words "LOLLIPOP" and "ICECREAM". They were given 5 minutes and could write more words on their list if desired and if time permitted. However, only writing of these two words was scored. This session was video-recorded, the use of environmental print was scored, and

general joint-writing mediation strategies were coded using Aram and Levin's (2002) maternal print and grapho-phonemic mediation scales. The second aim of Study 4 was to determine whether the use of environmental print and the general joint-writing mediation strategy used by mothers were related to the children's emergent literacy skills. It was hypothesized that mothers who used environmental print and higher levels of mediation to scaffold their child's writing would have children with more advanced emergent literacy skills. However, as correlation does not imply causation, the aim of the next part of this research was to directly investigate the effects of environmental print on emergent literacy growth by conducting an experimentally designed intervention study.

### **Intervention Study 5**

Some evidence exists to suggest that children's early experiences with environmental print benefits emergent literacy. For example, case studies (e.g., Lass, 1982) and observational studies (e.g., Purcell-Gates, 1996) have reported that young children naturally interact with environmental print and that these early experiences foster alphabet and word knowledge. Also Lomax and McGee (1987) showed that children's logographic reading of environmental print is positively related to emergent literacy skills. In the present research, the longitudinal case studies 1 and 2 provided evidence supporting the use of environmental print in the home setting to scaffold letter and word learning and emergent writing, and enhance print motivation. Observational studies 3 and 4 provided further evidence of mothers' general environmental print referencing and descriptions of innovative strategies used to specifically scaffold their children's literacy learning.



Enz et al. (2008) suggested that if an adult draws a child's attention to the letters and sounds embedded in environmental print words, the child may learn to de-contextualise the print from its colours and logo. However, to date this has not been adequately tested. Using environmental print to scaffold emergent literacy learning has been investigated by early intervention studies (Prior, 2003; Salewski, 1995, Vera, 2007; Wepner, 1985). However, due to the quasi-experimental nature of this research and some methodological limitations, the effects of environmental print on emergent literacy outcomes were not clear. Study 5 was designed to overcome limitations in earlier studies by ensuring that children were randomly assigned to groups, a wider range of emergent literacy skills were assessed, the intervention focused on print activities and were not mixed with storybook activities, follow-up testing was conducted to determine sustainability of outcomes, and home literacy activity details were collected to ensure these were similar across groups. In addition, using environmental print was compared with using standard print (the same words printed in manuscript form on cards) to determine the extent to which the colourful and meaningful nature of environmental print affects literacy outcomes.

Therefore, the aim of Study 5 was to investigate whether using environmental print was more effective than using standard print or no intervention in enhancing emergent literacy skills and print motivation in typically developing 3- to -4 year-old non-readers ( $N = 73$ ). Children were randomly assigned to the environmental print intervention group, the standard print intervention group, or the no intervention control group. The environmental print and standard print interventions only differed in the form of print used. The no intervention control group engaged in normal classroom activities. Furthermore, to ensure instructor fidelity and adherence to the program all intervention sessions were videoed and

coded and fidelity checked. Thus, this represented a methodologically valid assessment of the relative effectiveness of using environmental print in fostering emergent literacy skills.

The environmental print strategies that had been observed in the case studies (Studies 1 and 2) and observational studies (Studies 3 and 4) informed the intervention program. In these earlier studies, mothers were observed to scaffold their child's emergent literacy using multisensory strategies such as pointing to print, saying the names and sounds of letters, and tracing print with their fingers. It is thought that multisensory activities that simultaneously stimulate the visual, auditory, kinaesthetic, and tactile receptors provide an opportunity for literacy knowledge to be retained, processed, and retrieved more efficiently by the brain (Birsh, 2005, 2006; Henry & Hook, 2006; Moats & Farrell, 2005). Although little empirical research exists on the efficacy of multisensory teaching strategies (Dickman, 2006; Moats & Farrell, 2005), some preschool intervention studies have used multisensory activities in their literacy programs and found positive outcomes. For example, Bara, Gentaz, Cole, and Sprenger-Charolles (2004) trained children to learn letters using tactile and kinaesthetic senses by tracing letters with fingers. Similarly, Zafrana, Nikoltsou, and Daniilidou (2000) encouraged children to simultaneously touch and follow the shape of the letter while saying its sound. Therefore, Study 5 used multisensory strategies within the environmental print and standard print intervention programs. In addition, Chapter 7 provides a detailed review of multisensory strategies in early literacy learning and establishes a rationale for using multisensory strategies in the current intervention program.

The author, who is a trained teacher, conducted all interventions. Small groups (3 – 5 children) attended a 30-minute session each week for 8 weeks. The letters trained were

M, I, O, F, T, P, C, L, S, R, E, B, N, G, and A. Consistent with other letter training studies that have introduced 2 to 3 letters per session (Vera, 2007; Woodrome & Johnson, 2009), 3 letters were introduced per week for 5 weeks followed by revision of all letters in the final 3 weeks. The 15 letters that the children were trained in were taken from 5 cereal box labels (MILO, FROOT LOOPS, CORN FLAKES, RICE BUBBLES, NUTRI-GRAIN). Other words from product labels and signs (e.g., PEPSI, COCO POPS, STOP, LEGO) were used to search for focus letters during activities. The environmental print group used the words on the cereal boxes and other products and signs directly whereas the standard print group used the same words printed in black standard upper-case font on white cards.

The intervention sessions began with songs designed to introduce the directional language to be used in focusing on the letter shapes (up, down, around, and across). The multisensory strategy used to interact with the letters was Point (visual) and Say (auditory) and Move (kinaesthetic) and Trace (tactile). For example, the N in NUTRIGRAIN was pointed and looked at, the name and sound of the letter N said, N was shaped in the air using directional language (up, down, up), and traced on the box/card. The children were encouraged to find more examples of the same letter on other environmental print items/cards (e.g., N in CORNFLAKES). Finally, the instructor modelled writing the focus letter using the directional language whilst referring to the environmental print/card. Children then wrote the letter using the same strategies with verbal guidance from the instructor.

Repeated assessments on a range of emergent literacy measures (letter name and sound knowledge, letter writing, print concepts, environmental print and standard print word reading and print motivation) occurred at pre-, post-, and 2-month follow-up times to

determine emergent literacy growth during the intervention and to establish whether any gains were sustained over the medium-term. Several potential control factors were included such as home literacy activities and receptive language. If adult-guided focus on letters in environmental print is effective in fostering emergent literacy (Prior, 2003; Enz et al., 2008; Vera, 2007), it was hypothesized that the environmental print group would show greater development in emergent literacy skills post-intervention than the no intervention control group. To the extent that environmental print is visually attractive and meaningful to young children (e.g., Vukelich et al., 2008), it was expected that children trained using environmental print were likely to have the motivation and subsequent opportunity to interact with environmental print within their broader environments on a daily basis. This, in turn, was expected to result in greater gains in this group than from the standard print intervention and to lead to sustained benefits at the medium-term follow-up.

### **Summary of the Research**

This research program aimed to increase understanding of the role environmental print plays in enhancing emergent literacy skills in preschool children. At a theoretical level, it addressed Ehri's (1995, 2005) reading model that suggests the pre-alphabetic phase is not part of reading development because children use logographic visual cues not letter-sound analysis skills to decode print. However, a key element of this phase is that children are visually attending to environmental print and can identify it as a whole and derive meaning from it. It follows that this natural interest in environmental print may be capitalized on and children's emergent literacy may be fostered through adult scaffolding by pointing out letters embedded within environmental print. The findings of the current

research will help inform parents and childhood educators on how best to utilize environmental print in order to foster emergent literacy.

Therefore, Studies 1 and 2 (case studies) and Studies 3 and 4 (observational studies) sought to enhance understanding of the ways in which mothers naturally use environmental print to scaffold children's print learning. The scaffolding strategies observed in these studies were then incorporated into Study 5 (intervention program) that investigated whether direct use of environmental print can foster emergent literacy and print motivation. In sum, these five studies produced important new knowledge about the role of environmental print in emergent literacy.

Thus to summarize, the aims of the PhD research were:

- 1) To describe how parents engage their children with environmental print,
- 2) To investigate how that interaction with environmental print is related to children's emergent literacy, and
- 3) To determine whether using environmental print in preschool settings can enhance a range of emergent literacy skills and print motivation and whether it does so more effectively than using standard print.

### **Thesis Outline**

The main part of this thesis, excluding this introductory chapter, the final concluding chapter, and some intervening preludes, consists of publications that have arisen from the PhD research outlined in this chapter. Some chapters are published journal articles and some are journal articles and a book chapter that are currently in press, have been revised and resubmitted to journals, or are currently submitted and under review with peer-

reviewed international journals. The intervening preludes to each chapter are designed to integrate these into a coherent thesis. The following section outlines the sequence of chapters.

## **Chapter 2**

### **The Role of Environmental Print in Emergent Literacy**

This review article is currently in press. Chapter 2 reviews evidence of the role environmental print plays in emergent literacy. Environmental print reading and emergent literacy are situated within current models of reading development (Ehri, 1995; Mason, 1980). Vygotsky's (1978) socio-cultural theory is used as a theoretical framework for understanding how environmental print may be utilized as a tool to scaffold emergent literacy skills. This article also reviews existing research on environmental print use to enhance emergent literacy skills in the preschool and home settings. It highlights the need for further empirical studies that examine the efficacy of using environmental print as a literacy learning tool to assist children's transition from reading logographically to acquiring emergent literacy skills (e.g., alphabet knowledge) necessary for future word decoding.

## **Chapter 3**

### **The Scaffolding of Emergent Literacy Skills in the Home Environment:**

#### **A Case Study (Study 1)**

This case study has been published. It describes how a mother used environmental print to scaffold her son's learning of letter names, shapes, and sounds from age two until he began school. It also describes the multisensory strategies that the mother used when

pointing out letters in environmental print that involved tracing the letters and using directional language (e.g., up, down, around, and across) to form letter shapes. Evidence is presented for how this maternal use of environmental print supported the child's early letter and word writing and increased his print motivation. Descriptions are included of the child's own engagement with environmental print that included pointing out letters embedded in environmental print and copying environmental print labels.

#### **Chapter 4**

##### **Parental Strategies to Scaffold Emergent Writing Skills in the Preschool Child within the Home Environment (Study 2)**

This case study has also been published. It examines more closely mother-child use of environmental print to scaffold a preschool child's emergent writing development from 3 to 4 years of age. Mother-child environmental print strategies described include the child tracing environmental print with her finger and the use of directional and descriptive language to scaffold letter and word writing. Evidence is presented for how these strategies fostered the child's letter knowledge, letter shaping, and word writing. Through these environmental print experiences, the child became motivated to explore environmental print further by pointing out letters embedded in environmental print and copying environmental print words from toy and grocery product labels.

## Chapter 5

### **Mother-Child Referencing of Environmental Print and its Relationship with Emergent Literacy Skills and Home Literacy (Study 3)**

Chapter 5 is a journal article that has been submitted and is currently under review. It is an observational study of mother-child interactions with environmental print that builds on Study 1 using a larger sample ( $N = 35$ ). Natural interactions with environmental print letters and words in an environmental print rich grocery shop setting were observed and described. Over two thirds of the mothers (69%) and 40% of the children aged 3 to 4 years spontaneously referenced environmental print words during play. However, only 11% of mothers and 8% of children referenced letters embedded within the environmental print words. Mothers were observed to utilize similar multisensory strategies to those described in Study 1 when referencing environmental print. Maternal referencing of environmental print was found to be positively associated with children's print concepts and letter and name writing. A positive relationship was found between home reading (as measured by a children's book title checklist) and maternal environmental print referencing in the play setting suggesting that mothers who engage in home reading may be more likely to engage in environmental print referencing behaviours. However, maternal referencing of environmental print in the play setting was not related to mother's self-report of environmental print use or maternal literacy teaching at home. This discrepancy between self-report and observation measures highlights that home questionnaires may be subject to social desirability bias.



## Chapter 6

### **Mother-child Joint Writing in an Environmental Print Setting: Relations with Emergent Literacy (Study 4)**

Chapter 6 has been published. It builds on Study 2 by examining the extent to which a larger sample of mothers ( $N = 35$ ) naturally use environmental print to scaffold their children's emergent writing. The joint writing task was performed by the same sample and in the same environmental print rich grocery shop play setting described in Study 3 (Chapter 5). More broadly, this study examined the general strategies that English-speaking mothers use to mediate their child's emergent writing, extending the research by Aram and Levin (2001; 2002) who worked with Hebrew script. A particular focus of this study was to investigate mother's natural use of environmental print as a tool to scaffold their child's writing.

Only four mothers were observed to use environmental print to scaffold their child's writing of a grocery list. The environmental print strategies these mothers used were described and involved pointing out letters and words on product labels or shop signs, referring to them by their letter names, encouraging copying of the environmental print, and using descriptive and directional language to scaffold the shaping of letters. In general, the most common print mediation strategy (42.9%) was the use of descriptive and directional language by mothers to scaffold their child's letter shaping. Around two thirds of mothers (68.6%) dictated letter names to help their child spell words. A few mothers also traced letter shapes on their child's paper with their finger and wrote letter shapes in the air, which were similar to the multisensory strategies observed in Studies 1 to 3 (Chapters 3 - 5).

Maternal mediation strategies in general were positively related to children's letter sound knowledge and print concepts. However, due to the small number of mothers who used environmental print to scaffold their child's writing, it was unclear if this was related to emergent literacy.

## **Chapter 7**

### **Multisensory Methods for Early Literacy Learning**

Chapter 7 is a book chapter in press. It reviews the use of multisensory methods in early literacy teaching and learning. Current knowledge about multisensory processes in the brain and the role of multisensory teaching in early literacy learning, including studies that have used these approaches in preschool settings are reviewed. Potential applications in preschool and home settings are also discussed. The review highlights the lack of existing research on the efficacy of multisensory strategies. Despite this, educators believe they are of benefit to early literacy learning.

In the present research, mothers and children were observed using multisensory strategies to interact with environmental print in the longitudinal case studies 1 and 2 (Chapters 3 and 4) and observational studies 3 and 4 (Chapters 5 and 6). These multisensory strategies included looking and pointing to letters (visual), saying and hearing their names and sounds (auditory), forming letter shapes in the air (kinaesthetic), and tracing their shapes with a finger (tactile). Due to these findings and evidence of these strategies used in previous studies reviewed in Chapter 7 (e.g., Bara et al., 2004; Zafarana et al., 2000), multisensory activities were incorporated into the intervention Study 5 (Chapter 8).

## **Chapter 8**

### **Using Environmental Print to Enhance Emergent Literacy and Print Motivation (Study 5)**

Chapter 8 is a journal article that is currently submitted and undergoing review. It examines the effectiveness of using an environmental print versus standard print intervention compared to no intervention to enhance emergent literacy (letter name and sound knowledge, print concepts, letter writing, standard print and environmental print word reading, and print motivation). Children ( $N = 73$ ) were randomly assigned to an environmental print intervention, standard print intervention (same intervention but using the words in manuscript form rather than in context), or no intervention control group. The two intervention programs incorporated similar multisensory activities. The environmental print group performed significantly better on letter sound knowledge, letter writing, and standard print word reading than the control group at post-test and 2-month follow-up, and on print concepts at post-test only. The environmental print group outperformed both the standard print and control groups on print motivation and environmental print reading at post-test and 2-month follow-up. In contrast, the standard print group only outperformed the control group on letter writing and standard print word reading at post-test. However, there were no differences between groups on letter name knowledge. Overall, the results showed that environmental print is effective in enhancing a range of emergent literacy skills and print motivation in the preschool setting.

## **Chapter 9**

### **General Discussion**

Chapter 9 provides a summary of the main findings of the longitudinal case studies 1 and 2 (Chapters 3 and 4), naturalistic observational studies 3 and 4 (Chapters 5 and 6), and intervention Study 5 (Chapter 8). These findings are considered within the framework of existing theories of reading and writing development. Implications on the use of environmental print to scaffold emergent literacy are discussed and recommendations made for early childhood educators. Directions for future research highlight the need to investigate the effects of parental use of environmental print in the home setting to scaffold emergent literacy and the contribution of multisensory approaches to early literacy learning.

## References

- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.
- Aram, D. (2002). Joint-writing in Hebrew of dictated words versus proper names: Analysis of low SES mother-kindergartner dyads. *Journal of Research in Childhood Education, 17*, 47-61.
- Aram, D., & Levin, I. (2001). Mother-child joint-writing in low SES sociocultural factors, maternal mediation, and emergent literacy. *Cognitive Development, 16*, 831-852.
- Aram, D., & Levin, I. (2002). Mother-child joint-writing and storybook reading: Relations with literacy among low SES kindergarteners. *Merrill-Palmer Quarterly, 48*, 202-224.
- Aram D., & Biron, S. (2004). Joint storybook reading and joint-writing interventions among low SES preschoolers: differential contributions to early literacy. *Early Childhood Research Quarterly, 19*, 588-610.
- Australian Government (2005). *National inquiry into the teaching of literacy: Teaching reading, report and recommendations* (Publication No. 0 642 77577 X). Canberra, Australian Capital Territory: Government Printing Office, Commonwealth of Australia.
- Baghban, M. (1984). *Our daughter learns to read and write: A case study from birth to three*. Newark, DE: International Reading Association.

- Baker, L., Scher, D., & Mackler, K. (1997). Home and family influences on motivations for reading. *Educational Psychologist, 32*, 69-82.
- Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology, 23*, 239-269.
- Bara, F., Gentaz, E., Cole, P., & Sprenger-Charolles, L. (2004). The visuo-haptic and haptic exploration of letters increases the kindergarten-children's understanding of the alphabetic principle. *Cognitive Development, 19*, 433-449.
- Birsh, J. R. (2005). *Multisensory teaching of basic language skills*. Baltimore, MD: Paul H. Brookes.
- Birsh, J. R. (2006). What is multisensory structured language? *Perspectives: The International Dyslexia Association, 32*, 15-20.
- Blair, R., & Savage, R. (2006). Name writing but not environmental print recognition is related to letter-sound knowledge and phonological awareness in pre-readers. *Reading and Writing, 19*, 991-1016.
- Bodrova, E., & Leong, D. J. (2007). *Tools of the mind: The Vygotskian approach to early childhood education*. Upper Saddle River, NJ: Prentice Hall.
- Bowman, M. & Treiman, R. (2004). Stepping stones to reading. *Theory into Practice, 43*, 295-303.
- Burns, M.S., & Casbergue, R. (1992). Parent-child interaction in a letter-writing context. *Journal of Reading Behaviour, 24*, 289-312.

- Byrne, B., & Fielding-Barnsley, R. (1989). Phonemic awareness and letter knowledge in the child's acquisitions of the alphabetic principle. *Journal of Educational Psychology, 81*, 313-321.
- Clay, M. M. (1998). *By different paths to common outcomes*. Portland, ME: Stenhouse.
- Clay, M. M. (2005). *An observation survey of early literacy development*. Auckland, NZ: Heinemann.
- Cloer, T., Aldridge, J., & Dean, R. M. (1981/1982). Examining different levels of print awareness. *Journal of Language Experience, 4*, 25-33.
- Cronin, V., Farrell, D., & Delaney, M. (1999). Environmental print and word reading. *Journal of Research in Reading, 22*, 271-282.
- DeBaryshe, B. D., Buell, M. J., & Binder, J. C. (1996). What a parent brings to the table: Young children writing with and without parental assistance. *Journal of Literacy Research, 28*, 71-90.
- Dickman, G. E. (2006). To multisensory or not to multisensory, that is the question. *Perspectives: The International Dyslexia Association, 32*, 3.
- Dodici, B. J., Draper, D. C., & Peterson, C. A. (2003). Early parent-child interactions and early literacy development. *Topics in Early Childhood Special Education, 23*, 124-136.
- Ehri, L. C. (1995). Phases of development in learning to read words by sight. *Journal of Research in Reading, 18*, 116-125.

- Ehri, L. C. & McCormick, S. (1998). Phases of word learning: Implications for instruction with delayed and disabled readers. *Reading and Writing Quarterly*, *14*, 135-163.
- Ehri, L. C. (2005). Learning to read words: theory, findings and issues. *Scientific Studies of Reading*, *9*, 167-188.
- Ehri, L. C., & Roberts, T. (2006). The roots of learning to read and write: Acquisition of letters and phonemic awareness. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research: Vol. 2.* (pp. 113-130). New York, NY: Guildford Press.
- Enz, B. J. Prior, J., Gerard, M. R., & Han, M. (2008). Exploring intentional instructional uses of environmental print in preschool and primary grades. In A. DeBruin-Parecki (Ed.), *Effective early literacy practice: Here's how, here's why.* (pp. 15-24). Baltimore, MD: Paul. H. Brookes.
- Foulin, J. N. (2005). Why is letter-name knowledge such a good predictor of learning to read? *Reading and Writing*, *18*, 129-155.
- Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. Patterson., J. Marshall & M. Coltheart (Eds.), *Surface dyslexia: Neuropsychological and cognitive studies of phonological reading*, (pp. 301-330). London, UK: Erlbaum.
- Goodall, M. (1984). Can four year olds “read” words in the environment? *Reading Teacher*, *37*, 478-482.
- Goodman, Y. (1986). Children coming to know literacy. In W. H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (1-14). Norward, NJ: Ablex.



- Green, C. (1987). Parents' facilitation of young children's writing. *Early Child Development and Care*, 28, 129-136.
- Hall, N. (1987). *The emergence of literacy*. London, U.K: Hodder & Stoughton.
- Harste, J. C., Woodward, V. A., & Burke, C. L. (1984). *Language stories and literacy lessons*. Portsmouth, NH: Heinemann.
- Henry, M. K., & Hook, P. (2006). Multisensory instruction: Then and now. *Perspectives: The International Dyslexia Association*, 32, 9-11.
- Hiebert, E. H. (1978). Preschool children's understanding of written language. *Child Development*, 49, 1231-1234.
- Hood, M., Conlon, E., & Andrews, G. (2008). Preschool home literacy practices and children's literacy development: A longitudinal analysis. *Journal of Educational Psychology*, 100, 252-271.
- Horner, S. L., (2005). Categories of environmental print: All logos are not created equal. *Early Childhood Education Journal*, 33, 113-119.
- Justice, L. M., & Ezell, H. K. (2000). Enhancing children's print and word awareness through home-based parent intervention. *American Journal of Speech-Language Pathology*, 9, 257-269.
- Justice, L. M., & Ezell, H. K. (2001). Word and print awareness in 4-year-old children. *Child and Language Teaching and Therapy*, 17, 207-225.

- Justice, L. M., & Ezell, H. K. (2002). Use of storybook reading to increase print awareness in at-risk children. *American Journal of Speech-Language Pathology, 11*, 17-29.
- Kassow, D. Z. (2006). Environmental print awareness in young children. *Talaris Research Institute, 1*, 1-8.
- Kuby, P., Goodstadt-Killoran, I., Aldridge, J., & Kirkland, L. (1999). A review of research on environmental print. *Journal of Instructional Psychology, 26*, 173-182.
- Kuby, P., & Aldridge, J. (2004). The impact of environmental print instruction on early reading ability. *Journal of Instructional Psychology, 9*, 106-114.
- Lass, B. (1982). Portrait of my son as an early reader. *The Reading Teacher, 36*, 20-28.
- Levin, I., Shatil-Carmon, S., & Asif-Rave, O. (2006). Learning of letter names and sounds and their contribution to word recognition. *Journal of Experimental Child Psychology, 93*, 139-165.
- Lomax, R. G., & L. M. McGee. (1987). Young children's concepts about print and reading: Toward a model of word reading acquisition. *Reading Research Quarterly, 22*, 237-256.
- Lujan, M. E & Wooden, S. L. (1984). An exploration of environmental correlates of early childhood literacy. (Report No. PS 015 101). New Mexico: New Mexico State University. (Retrieved from ERIC Document Reproduction Service No. ED 258 696, Accessed: 13/7/09).

- Lynch, J. (2008). Engagement with print: Low-income families and Head Start children. *Journal of Early Childhood Literacy*, 8, 151-175.
- Mann, V. A., & Foy, J. G. (2003). Phonological Awareness, Speech Development, and Letter Knowledge in Preschool Children. *Annals of Dyslexia*, 53, 149-173.
- Mason, J. M. (1980). When do children begin to read: an exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly*, 15, 203-227.
- Masonheimer, P. E., Drum, P. A., & Ehri, L. C. (1984). Does environmental print identification lead children into word reading? *Journal of Reading Behaviour*, 16, 257-271.
- McGee, L. M., Lomax, R.G., & Head, M. H. (1988). Young children's written language knowledge: What environmental print and functional print reading reveals. *Journal of Reading Behaviour*, 20, 99-118.
- McGee, L. M. & Richgels, D. J. (1989). "K is Kristen's": Learning the alphabet from a child's perspective. *The Reading Teacher*, 43, 216-225.
- McNaughton, S. (1995). *Patterns of emergent literacy: Processes of development and transition*. Melbourne, Australia: Oxford University Press.
- Moats, L. C & Farrell, M. L. (2005). Multisensory structured language education. In J. R. Birsh (Ed.), *Multisensory teaching of basic language skills* (2<sup>nd</sup> ed., pp. 23-41). Baltimore, MD: Paul H. Brookes.

- Molfese, V. J., Beswick, J. L., Molnar, A., & Jacobi-Vessels, J. (2006). Alphabetic skills in preschool: A preliminary study of letter naming and letter writing. *Developmental Neuropsychology, 29*, 5-19.
- Neuman, S. B., & Roskos, K. (1993). Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal, 30*, 95-122.
- Neuman, S. B., & Roskos, K. (1997). Literacy knowledge in practice: Contexts of participation for young writers and readers. *Reading Research Quarterly, 32*, 10-32.
- Nutbrown, C., Hannon, P., & Morgan, A. (2005). *Early literacy work with families: Policy, practice and research*. London, UK: Sage.
- Prior, J. L. (2003). Real world print in the classroom: meaningful connections for learning to read. Unpublished Doctoral Dissertation. Arizona State University, Arizona USA. (Retrieved from Proquest UMI No. 3084666).
- Purcell-Gates, V. (1996). Stories, coupons, and the TV guide: Relationships between home literacy experiences and emergent literacy knowledge. *Reading Research Quarterly, 31*, 406-428.
- Richgels, D. J., Poremba, K. J., & McGee, L. M. (1996). Kindergarteners talk about print: phonemic awareness in meaningful contexts. *The Reading Teacher, 49*, 632-642.
- Salewski, W. C. (1995). *The effect of environmental print reading on the literacy development of kindergarten children*. Unpublished Master's Dissertation, The University of British Columbia, Vancouver Canada. (Retrieved from

[https://circle.ubc.ca/bitstream/2429/3660/1/ubc\\_1995-0145.pdf](https://circle.ubc.ca/bitstream/2429/3660/1/ubc_1995-0145.pdf). Accessed 27/7/2009).

Saracho, O. N. (1997). Using the home environment to support emergent literacy. *Early Child Development and Care*, 127-128, 210-216.

Sinclair, A., & Golan, M. (2002). Emergent Literacy: A case-study of a two-year-old. *Early Child Development and Care*, 172, 555-572.

Snow, C. E., Burns, S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.

Sonnenschein, S., & Munsterman, K. (2002). The influence of home-based reading interactions on 5-year-olds' reading motivations and early literacy development, *Early Childhood Research Quarterly*, 17, 318-337.

Stellakis, N., & Kondyli, M. (2004). The emergence of writing: Children's writing during the pre-alphabetic spelling phase. *Educational Studies in Language and Literature*, 4, 129-150.

Teale, W. H. (1986). Home background and young children's literacy development. In W.H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (pp. 173-206). Norwood, NJ: Ablex.

Treiman, R., Cohen, J., Mulqueeny, K., Kessler B., & Schechtman, S. (2007). Young children's knowledge about printed names. *Child Development*, 78, 1458-1471.

- Vera, D. (2007). *The use of popular culture environmental print to increase the emergent literacy skills of prekindergarten children in one high-poverty urban school district*. Unpublished doctoral dissertation, Texas A & M University, Texas. (Retrieved from <http://proquest.umi.com.libraryproxy.griffith.edu.au/pqdweb>. Accessed 22/3/09).
- Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early Childhood Research Quarterly*, 9, 153-170.
- Vukelich, C., Christie, J., & Enz, B. (2008). *Helping young children learn language and literacy: Birth through kindergarten*. Boston, MA: Pearson.
- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.
- Welsch, J. G., Sullivan, A., & Justice, L. M. (2003). That's my letter!: What preschoolers' name writing representations tell us about emergent literacy knowledge. *Journal of Literacy Research*, 35, 757-776.
- Wepner, S. B. (1985). Linking logos with print for beginning reading success. *Reading Teacher*, 38, 633-639.
- Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, 69, 848-872.
- Wood, D., Bruner, J. C., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, 17, 89-100.
- Woodrome, S. E., & Johnson, K. E. (2009). The role of visual discrimination in the learning-to-read process. *Reading and Writing*, 22, 117-131.

Yang, H., & Noel, A. M. (2006). The developmental characteristics of four- and five-year-old preschoolers' drawing: An analysis of scribbles, placement patterns, emergent writing, and name writing in archived spontaneous drawing samples. *Journal of Early Childhood Literacy*, 6, 145-162.

Yannicopoulou, A. (2006). The influence of environmental print on preschoolers' literacy development in a two-alphabet society. *L1 – Educational Studies in Language and Literature*, 6, 1-12.

Zafrana, M., Nikoitsou, K., & Daniilidou, E. (2000). Effective learning of writing and reading at preschool age with a multisensory method: A pilot study. *Perceptual and Motor Skills*, 91, 435-446.

## Chapter 2 Prelude

### The Role of Environmental Print in Emergent Literacy

This chapter reviews the existing literature on the role of environmental print in emergent literacy development. This review is currently in press with the *Journal of Early Childhood Literacy*. From birth, children perceive and gain meaning from environmental print through socio-cultural experiences with it (Baghban, 1984; Goodman, 1996; Harste & Woodward, 1989). Established models of reading development refer to early environmental print reading as logographic because children identify the print by using cues from the logo (e.g., identify McDonalds by recognising the golden arches of the M; Bowman & Treiman, 2004; Frith, 1984). Some debate exists over the contribution of logographic reading (using visual cues as opposed to letter-sound analysis skills) to future reading ability (Masonheimer, Drum, & Ehri, 1984; Kassow, 2006; Vukelich, Christie, & Enz, 2008). A correlational study provides evidence that children's logographic reading is associated with emergent literacy skills, which, in turn, are related to word reading skills (Lomax & McGee, 1987). Existing studies are limited in their designs and provide mainly observational (e.g., Lass, 1982; McGee & Richgels, 1989; Sinclair & Golan) and quasi-experimental evidence (Salewski, 1995; Vera, 2007; Wepner, 1985) that environmental print can foster emergent literacy. It is concluded that further empirical research is required to investigate whether adult or parent use of environmental print through scaffolding strategies that help young children de-contextualise environmental print (e.g., pointing out letters embedded within environmental print) may be beneficial to emergent literacy development. Furthermore, such research may provide a clearer view of the role of environmental print in emergent literacy development.



**Statement of contribution to Chapter 2 co-authored paper in press**

Neumann, M. M., Hood, M., Ford, R., & Neumann, D. L. (in press). The role of environmental print in emergent literacy. *Journal of Early Childhood Literacy*.  
Accepted: 7/1/2011

This chapter includes a co-authored paper in press. The bibliographic details of the co-authored paper, including all authors, are: Michelle. M. Neumann, Dr Michelle Hood, Dr Ruth Ford, Associate Professor David Neumann

My contribution to the paper involved the literature review and writing of the review paper. The co-authors provided review of drafts.

Name of Student: Michelle Neumann

(Signed)

Corresponding authors of paper:

Name of Corresponding Authors:

(Countersigned) Dr Michelle Hood

(Countersigned) Dr Ruth Ford

(Countersigned) Associate Professor David Neumann

(Countersigned) Dr Michelle Hood

Supervisor: Name of Supervisor

## **Chapter 2**

### **The Role of Environmental Print in Emergent Literacy**

Michelle M. Neumann, Michelle Hood, Ruth M. Ford, & David L. Neumann

School of Psychology, Griffith University, QLD 4222, Australia

Please direct correspondence to:

Michelle Neumann: School of Psychology, Gold Coast Campus, Griffith University, QLD 4222, Australia. E-mail: [Michelle.Neumann@griffithuni.edu.au](mailto:Michelle.Neumann@griffithuni.edu.au) Facsimile: +61(0)7 5552 8291, Telephone: +61(0)7 5552 9121.

### **Abstract**

Young children are surrounded by environmental print on a daily basis. Through their visual exploration of environmental print, coupled with socio-cultural experiences, children gain valuable semantic and symbolic knowledge as they make sense of their world. The aim of this review is to examine the question of whether environmental print has value as a literacy learning resource, and if so, the mechanisms by which it promotes literacy development. It is shown that interactions with environmental print in the child's socio-cultural context can develop their logographic reading skills. These skills, in turn, promote the development of emergent literacy skills that are the precursors to conventional reading skills. Environmental print may also be used more directly when parents and childhood educators use it to scaffold the learning of emergent literacy skills. It is recommended that parents and early childhood educators capitalise on children's natural attraction to environmental print by using it to promote their literacy development.

*Keywords:* environmental print, emergent literacy, parent-child interactions, scaffolding, multisensory strategies, reading models.

## Introduction

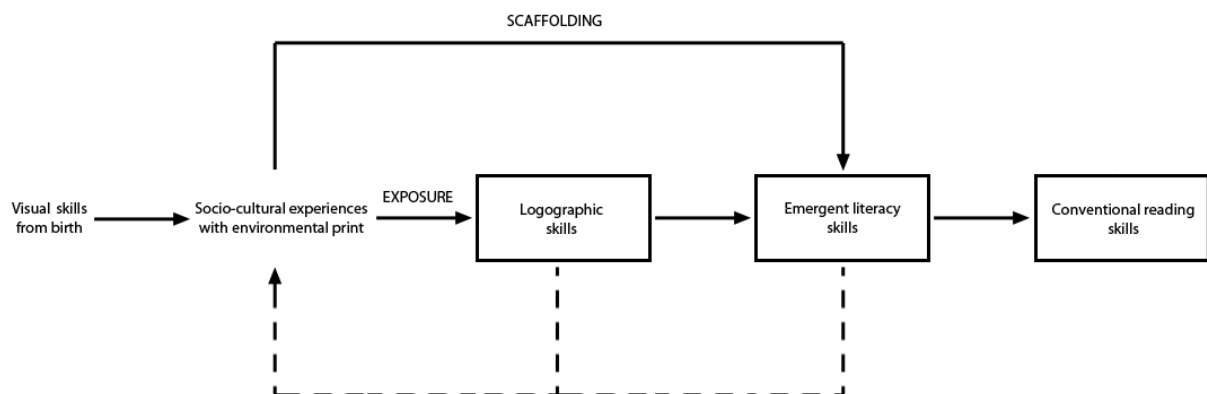
Environmental print is defined as surrounding non-continuous print (e.g., words, letters, numerals, and symbols) that is encountered in a particular context and fulfils real-life functions (Adams, 1990; Kassow, 2006; Vukelich, Christie & Enz, 2008). In this way, environmental print differs from continuous print found in books, newspapers, and magazines (Hall, 1987). Horner (2005) classified environmental print into three categories: child logos (e.g., Barbie, Lego), community logos (e.g., signs such as STOP, McDonalds) and household logos (e.g., Froot Loops, Yoplait). Horner's categories show that a wide range of environmental print exists in a child's environment and, by consequence, the potential this ubiquitous print has for fostering early print knowledge. In contrast to standard print in books, environmental print is visually attractive and personally meaningful to young children, stimulating their immediate interest and attention (Adams, 1990; Baghban, 1984; Prior & Gerard, 2004; Vukelich et al., 2008). Furthermore, through socio-cultural experiences with environmental print, young children use it to fulfil real-life functions and achieve their individual goals and needs (e.g., knowing that a specific label on a box means that it contains their favourite food; Goodman, 1986; Harste & Woodward, 1989). It is also a free literacy resource readily accessible to children across all social boundaries. Indeed, children from low or middle socioeconomic backgrounds have similar levels of environmental print knowledge (Dickinson & Snow, 1987; Korat, 2005).

However, the precise role that environmental print plays in a child's literacy development is in need of further clarification and debate. The mere exposure to environmental print may not be sufficient for it to benefit literacy development in young children. As noted by Harste, Woodward, and Burke (1984), not all encounters with

environmental print are of equal worth because “time on task” (p. 48) and the quality of the encounter are important variables in literacy learning. The value of environmental print in promoting literacy development has also been questioned due to its highly context-specific nature (Ehri, 1995; Ehri & Roberts, 2006; Masonheimer, Drum, & Ehri, 1984). Conversely, it is through environmental print that children may learn that print communicates meaning even if they cannot explicitly read the print (Goodman & Altwerger, 1981; Goodman, 1986; Harste et al., 1984). In addition, it has been argued that environmental print can help children learn early literacy skills (Kuby, Goodstadt-Killoran, Aldridge & Kirkland, 1999; McGee & Richgels, 1989; Prior & Gerard, 2004; Vera, 2007; Vukelich et al., 2008) and this learning can be extended through scaffolding with an adult (Neumann, Hood & Neumann, 2009; Neumann & Neumann, 2010; Prior & Gerard, 2004; Rule, Dockstader & Stewart, 2006; Vera, 2007).

In this review, the role of environmental print in emergent literacy and later reading acquisition is examined. Studies for the review were selected if they had examined the reading of environmental print or used environmental print in the home or an educational setting to teach literacy skills in young children. The literature selected included observational, correlational, case study, and experimental methodologies. The aim of the review is to examine the question of whether environmental print has value as a literacy learning resource, and if so, the mechanisms by which it promotes literacy development. A socio-cultural perspective is taken in which it is recognised that environmental print has two potential implications for literacy development in young children. Not only is environmental print an everyday resource that children can use independently as they explore their environment, but also it is a resource that parents and teachers can use to

promote early literacy skills in children. Moreover, environmental print is seen as more relevant for the development of context-based (logographic) reading and emergent literacy skills in young children than for conventional reading skills in older children. These principles are shown schematically in Figure 1. As can also be seen in Figure 1, a child's experiences with environmental print are embedded within a socio-cultural context and are dependent on the development of visual skills from birth. The review will follow the structure outlined in Figure 1, starting with the development of visual skills. It will conclude with a discussion of the implications for literacy learning in the home and educational setting and areas in need of future research.



*Figure 1.* The role of environmental print in the acquisition of logographic and emergent literacy skills. The process is cyclical in nature where prior socio-cultural experiences with environmental print influence future print experiences.

## **The Emergence of Environmental Print Knowledge**

### **Early visual perception of environmental print**

From birth, a child's ability to understand environmental print is influenced by the development of the visual processing system. Harste et al. (1984) describes the visual processing of environmental print cues along the pathway from the retinal image to the brain at different levels of sophistication. For example, young children use visual cues such as discriminating a sign's outline configuration, limited text, letter style, geometric logo designs, and coloured patterns to gain meaning from environmental print (Harste et al., 1984). Likewise, visual perception plays a critical role in early reading development (Gibson, Gibson, Pick, & Osser, 1962). Visual perceptual skills such as the ability to attend to, process, discriminate and recognize letters (Glass, 2002) and learn that they hold a symbolic and communicative function (DeLoache, 2004) is fundamental to reading development (Gibson et al., 1962; Ferguson, 1975).

Normally developing infants appear to possess the basic ability to visually perceive and process fine patterns and symbolic shapes seen in environmental print very early in life. By one month, infants are able to voluntarily move their head and eyes toward a peripheral pattern, focus sharply at a very short distance, resolve, and attend to striped stimuli. Their ability to detect colour, orientation, motion, and disparity of stimuli is evident between 1-2 months (Johnson, 2005) and cortical mediated visual behaviour is readily observed as they attend to faces, objects, and fine patterns as their vision increases in acuity (Glass, 2002). At 2-3 months, infants show preferences towards objects, for example, preferring to view an image of a face first, followed by patterns (newspaper print), and lastly coloured disks

(Fantz, 1961). At 4 months, infants have the ability to reliably attend to and discriminate between visual symbols (Coldren & Haaf, 2000) such as those that might exist in environmental print.

This early visual ability is relevant to the perspective that reading is extracting meaning from the symbolic environment (e.g., when a child knows that a red, blue, and white Pepsi logo says “Pepsi” or golden arches says “McDonalds”). Thus, during toddlerhood this ability to differentiate between symbolic systems of pictures, letters, and numbers and understand that they hold a communicative function paves the way for early literacy development (Yamagata, 2007). For example, Baghban (1984) reported that her daughter Giti clearly distinguished print at 20 months, such as consistently recognising the M-shaped arches as *McDonalds* when it appeared as a sign or on a cup. By 24 months, Giti began to point out individual letters in environmental print such as the K in *Special K* and the M in *K-Mart*. Likewise, Lass (1982) described how at two weeks of age her son Jed began to stare with great interest at the letters on his parents’ T-shirts. At 17 months Jed enjoyed locating letters on signs and saying “B” or “D” for any of the 26 alphabet letters.

### **Socio-cultural Experiences with Environmental Print**

The further development of children’s ability to visually explore and analyse print is influenced by their socio-cultural experiences with it (Baghban, 1984; Goodman & Goodman, 1979; Harste & Woodward, 1989; McNaughton, 1995; 2006). Goodman (1986) states that “literacy is a cultural phenomenon” (p. 1) as society needs to communicate across time and space and that children grow up interacting with these literate environments. Harste, Burke, and Woodward (1981a; 1981b) concurs that written language



is sociologically rooted and describes how socio-cultural encounters with environmental print begin on the day an infant's mother pulls a diaper out of a Pamper's box, feeds them from jars with a Gerber's logo, and exposes them to their first encounter with the golden arches of McDonalds. These initial encounters provide children the flexibility and confidence in using their accumulating knowledge of environmental print to form and test their own hypotheses about print (Harste et al., 1981a).

Descriptive reports of young children's interactions with environmental print show that they are embedded within a socio-cultural context (Baghban, 1984; Lass, 1982; Lujan & Wooden, 1984; McGee & Richgels, 1989; Neumann et al., 2009; Sinclair & Golan, 2002). For example, Harste et al. (1981a) described an example based on 3-year-old Alison, while driving to the zoo with her family. Her father pointed to a road sign "West 465" and asked Alison, "What do you think that says?" Alison responded by saying "It says Daddy turn right here to go to the zoo" (p. 325). Although Alison was not reading the sign conventionally, the child was gaining meaning from the print in a way relevant to her socio-cultural environment. Thus, once a child recognises that environmental print conveys meaning, they may begin to read what it says even if their interpretation does not correspond to the actual words in the print (Goodman & Altwerger, 1981).

Once children begin to identify that environmental print conveys meaning, parents or adults around the child may begin to interact with the child in ways that aid their learning. Neumann and Neumann (in press) described how 2 year old James pointed to the print on a mail box (BEWARE OF THE DOG). His mother initially read the print for him and pointed out the D for Dog. In later encounters with this mail box sign, James pointed out the D for Dog himself. In Lass' (1982) description of Jed, it was reported that his

mother would begin to correct him when he misidentified letters (e.g., by saying “no that’s a G”). Jed then began to ask his mother what each letter he encountered was during walks along a commercial street, on signs, store names, numbers in store addresses, and sale signs. Through his own exploration and his mother’s help, Jed learnt how to visually distinguish and identify all the uppercase and most lowercase letters by 2 years of age.

In a case study of 2-year-old Luc, Sinclair and Golan (2002) reported how his parents used his interest in environmental print to informally teach letters and words. Luc was observed spontaneously reading product labels such as “GLACES” (ice-cream) and signs such as “STOP” that had been previously named by an adult. In another example when Luc was 2 years and 2 months, he said “Two Ms!” while pointing to a large orange MM supermarket logo. The adults around Luc focussed his attention on upper case letters and after the adults named the letter a few times, it was reported that Luc could identify them correctly. Luc subsequently built on his increasing knowledge of letters by exploring other print materials such as books, magazines, and toy catalogues, and initiating interactions with letters as he named them.

### **Environmental Print and Models of Reading Acquisition**

As noted above, prior research has suggested that children can extract meaning from environmental print (Goodman & Altwerger, 1981; Harste et al., 1981a) and that their literacy knowledge can be extended through social interactions with adults in their socio-cultural environment (McGee & Richgels, 1989; Prior & Gerard, 2004). However, some researchers have found that children are only reading the actual words contained in environmental print when they can decode the print both in context and in standard black

and white print with contextual cues removed (Cloer, Aldridge & Dean, 1981/1982; Goodall, 1984; Hiebert, 1978; Masonheimer et al., 1984). According to these findings, Harste's (1981a) example of Alison reading the sign "West 465" as telling her father how to get to the zoo is not reading in the conventional sense. For this reason, some researchers have suggested that the ability to identify environmental print is not related to the ability to read words fluently using letter-sound analysis skills (Dickinson & Snow, 1987; Ehri & Roberts, 2006; Kassow, 2006).

Masonheimer et al.'s (1984) results are commonly cited as evidence that merely being able to identify the meaning of environmental print in context does not constitute conventional reading. They presented an environmental print word in context (i.e., on the product) and with contextual cues gradually removed by (a) using the label removed from the product, (b) using a colour photo of the label, (c) using a black and white photo of the label, and (d) presenting the word in standard manuscript form. The print identification scores of the 3- to 5-year old children ( $N = 102$ ) progressively decreased as the contextual cues were removed. Most (94%) could not read the environmental print word when presented in standard print form. Importantly, letter name knowledge differentiated those who could read the word in standard print from those who could not. Those who could read the standard print scored an average of 98% on letter naming whereas those who could not scored an average of 62%. Masonheimer et al. (1984) also found that only the readers (i.e., those with letter knowledge) could detect letter errors when environmental print was deliberately altered in context (e.g., *PEPSI* altered to *XEPSI*). Therefore, they concluded that mastery of letter names, not experience with environmental print, distinguished readers from pre-readers.

Children who can only read environmental print in context have been named *logographic readers* (Beech, 2005; Frith, 1985, 1986) because they gain meaning from environmental print using salient visual, graphic and contextual cues. Logographic readers are unable to decode words due to a lack of letter-sound analysis skills. Instead, they rely on visual contextual cues such as the colours and pictures in which the print is embedded to read it (Blair & Savage, 2006; Cloer et al., 1981/1982; Ehri & McCormick, 1998; Ehri & Roberts, 2006; Goodall, 1984; Masonheimer et al., 1984; Purcell-Gates, 1996; Share & Gur, 1999; Treiman, Cohen, Mulqueeny, Kessler, & Schechtman, 2007). Logographic readers may attend more to the surrounding cues than to the print itself when reading environmental print. Most children develop the ability to extract meaning from environmental print using logographic skills before using alphabetic decoding skills (Beech, 2005; Bowman & Treiman, 2004; Ehri, 1995; Frith, 1985, 1986; Mason, 1980). However, it is possible that the value of logographic reading as a precursor skill in supporting the development of emergent literacy skills has been underestimated.

In one of the earliest reading acquisition models, Mason (1980) highlighted the role of logographic reading in the development of conventional reading skills. Further, Mason proposed that children's early experiences with environmental print facilitates their exploration of print and allows them to experiment and refine their print decoding strategies as their word reading skills emerge. Mason described a 3-stage hierarchical sequence of word reading acquisition using observations of preschool children. In Level 1 Context Dependent, children could only read environmental print signs or labels in context (e.g., Stop, Exit, and cereal names) and knew some letters. These children are thus logographic readers. In Level 2 Visual Recognition, children could, in addition to reading

environmental print in context, read some simple book words, like *no* and *dog* and had mastered letter names. In Level 3 Letter-sound Analysis, children could read most 3- to 5-letter words presented in standard print by sounding out words. Only at this level did children show an ability to read environmental print in and out of context using letter-sound analysis skills.

Ehri's (1995) later reading model contains four phases and shares some characteristics with Mason's (1980) model. Ehri's first phase is labelled Pre-alphabetic in which children make connections between visual features/contextual cues and their pronunciation or semantic representation. This phase corresponds to Mason's (1980) Context Dependency (logographic reading) and Visual Recognition stages in that it acknowledges the lack of application of a letter-sound analysis during environmental print reading. Ehri and McCormick (1998) suggested that the Pre-alphabetic phase is not part of the reading system because children do not decode the words, but rely on visual contextual cues to extract meaning. In the next phase, Partial-alphabetic, children can identify names and major consonant sounds, with increasing use of letter-sound associations and decreasing use of non-alphabetic contextual cues. In the Full-alphabetic phase, children have mastered letter names and sounds, have an increasing sight-word bank and use letter-sound analysis (phonetic) strategies to decode words. Finally, in the Consolidated phase, children's word reading increases in fluency and spelling ability becomes increasingly sophisticated with continuing practice.

To more clearly highlight the role of environmental print in literacy development in this review, a simplified model of reading development is used. The model contains three phases that combines elements of Mason's (1980) and Ehri's (1995) models (see text in

boxes in Figure 1). The first phase of Logographic skills corresponds to Mason's Context Dependent phase and a component of Ehri's Pre-alphabetic phase. The second phase of Emergent literacy skills corresponds to Mason's Visual Recognition and Ehri's Partial-alphabetic phases. Emergent literacy skills include alphabet knowledge, concepts about print (e.g., concept of word and letter), emergent writing, and phonological awareness. Emergent literacy skills are acquired during the preschool and early school years and are significantly related to future reading and writing ability and long-term academic outcomes (Adams, 1990; Aram & Levin, 2002; Baker, Scher & Mackler, 1997; Riley, 1996; Ritchey, 2008; Snow, Burns & Griffin, 1998; Whitehurst & Lonigan, 1998). The final phase of Conventional reading skills corresponds to Mason's Letter-sound Analysis and Ehri's Full-Alphabetic and Consolidated Reading phases.

Both Mason's (1980) and Ehri's (1995) reading models describe environmental print reading behaviours as occurring prior to letter-sound analysis. As such, one role that environmental print plays in literacy development is to promote the acquisition of logographic skills (see Figure 1). The relationship between environmental print experiences and the development of logographic skills has been supported by observations made in several studies (e.g., McGee & Richgels, 1989; Neumann & Neumann, in press; Sinclair & Golan, 2002). As noted earlier, these experiences are embedded within a socio-cultural context. However, what is less well established is how logographic reading skills developed through experiences with environmental print impact upon emergent literacy skills that subsequently form the foundation of conventional reading ability.

## **The Relationship between Environmental Print Reading and Emergent Literacy Skills**

Children may use different pathways to construct the same knowledge (Bastien-Toniazzo & Jullien, 2001). The reading models of Mason (1980) and Ehri (1995) suggest that environmental print can be read in two ways - logographic reading (using graphic and contextual cues) and conventional reading (using letter-sound decoding skills). The models differ in their view on the significance of environmental print in reading development. Mason emphasised the possible benefits of environmental print on subsequent reading development. In contrast, Ehri suggested that environmental print may not play a significant role in reading because children pay little attention to the print or individual letters and cannot read the environmental print words when transformed into standard print (see also Dickinson & Snow, 1987; Kassow, 2006; Ehri & Roberts, 2006; Masonheimer et al., 1984).

As noted earlier, Masonheimer et al. (1984) showed that children could only read environmental print words out of context if they had already developed conventional reading skills such as mastered letter-name knowledge. However, it may be argued that this study presents only a snapshot of a child's ability at one moment in time. Learning to read is a developmental process (Bowman & Treiman, 2004). It is possible that environmental print knowledge will promote the learning of skills that are precursors to later conventional reading skills. In support of this notion, Cronin, Farrell and Delaney (1999) investigated whether environmental print knowledge (e.g., logographic reading of McDonalds, Stop, Dairy Queen) affects later word learning ability. They showed that non-reading 4- to 5-

year-olds could learn environmental print words when presented in standard print form more quickly if they could already recognize the environmental print word in context. While the mechanism behind this effect remains to be determined, it does suggest that environmental print knowledge can play a role in early reading development. Other research has also revealed that environmental print knowledge is positively related to emergent literacy skills, which in turn predict conventional reading (Lomax & McGee, 1987; McGee, Lomax & Head, 1988; Molfese, Modglin, Beswick, Neamon, Shelby, Berg, & Molnar, 2006; Reutzel, Fawson, Young, Morrison & Wilcox, 2003).

Lomax and McGee (1987) found a positive relationship between environmental print reading in context (e.g., Coke, Pac-Man, M&Ms, Stop, 7-Eleven) and emergent literacy skills (print concepts, phoneme awareness, letter name, shape, and sound knowledge) in children aged 3 to 6 years ( $N = 81$ ). The emergent literacy skills were, in turn, related to word reading. They described a five-component model of word reading acquisition that included print concepts, graphic awareness, phonemic awareness, grapheme-phoneme correspondence, and word reading. They found that environmental print reading ability (a sub-component of print concepts) was related to graphic awareness (letter discrimination, letter orientation and word discrimination). Graphic awareness was, in turn related to phonemic awareness skills, grapheme-phoneme correspondence (letter name/sound analysis skills), and finally word reading skills. The print concepts component was also directly related to letter-sound knowledge. Thus, Lomax and McGee showed that environmental print reading is related to emergent literacy skills that develop prior to formal literacy instruction and that are directly or indirectly related to word reading.



Further evidence supporting the importance of environmental print in emergent literacy was reported by McGee et al. (1988). They showed that 3- and 4-year-old non-readers ( $N = 31$ ) who could read environmental print in context were aware that it consisted of letters by being able to identify those letters. This contrasts with the results of Masonheimer et al. (1984), which suggests that non-readers are insensitive to letter details in environmental print. Furthermore, McGee et al. (1988) showed that although non-readers and conventional readers may have similar letter knowledge, what differs is that the readers know how to use that letter knowledge to decode words. Thus, pointing out letter names and sounds within environmental print words (Neumann & Neumann, in press; Sinclair & Golan, 2002) and showing children how to use this alphabetic knowledge may help children move from context-dependency towards using letter-sound analysis strategies to decode words.

Reutzel et al. (2003) also provided evidence that reading environmental print in context might constitute an initial stage of reading. They demonstrated that a range of print and phoneme knowledge including print concepts (Concepts About Print; Clay, 1993), letter recognition, phonemic awareness, and word reading play an important role in environmental print reading, both in and out of context (e.g., McDonalds, Cheerios, Crest, Kentucky Fried Chicken, Jello, Snickers, Stop, Coca Cola). They classified 97 children aged 4 to 7 years into environmental print reading ability groups: non-responders, novice, experimenting, and conventional environmental print readers. As expected, the conventional readers had greater print and phoneme knowledge than experimental readers who themselves had greater knowledge than novices. Word recognition and Concepts About Print were the most important discriminators of the ability to read environmental

print in and out of context as well as with altered spelling. Reutzal et al. argued that the visual skills used in environmental print reading are not unlike skills used in conventional word reading and should, therefore, be fostered very early in literacy development by encouraging children to attend to letters and sounds within environmental print.

Molfese et al. (2006) examined the development of conventional and environmental print reading skills in 4-year-old children ( $N = 57$ ) from low income homes. General cognitive abilities, phonological awareness, print knowledge, and writing were assessed and Fall to Spring gains were measured. In addition, environmental print knowledge was assessed using coloured pictures of logos, signs, and products (e.g., McDonalds, Burger King, Taco Bell, Kroger, Blockbuster, Target, restroom and school crossing). The gains made by the children were lower than expected for letter knowledge, although gains in letter knowledge was significantly and positively correlated with reading environmental print in context.

Taken together, there is some evidence that logographic reading of environmental print plays an important role in developing emergent literacy skills, which, in turn, contributes to conventional word reading skills. Such evidence supports researchers who propose that logographic reading forms an early and legitimate component of reading development (Cronin et al., 1999; Mason, 1980; McGee et al., 1988; Reutzal et al., 2003). The role of environmental print in promoting conventional reading thus appears to follow a pathway leading from socio-cultural experiences that expose the child to environmental print and its meaning, to the development of logographic skills, followed by the development of emergent literacy skills, and finally the development of conventional reading skills (see Figure 1). The extent to which experiences with specific types of

environmental print (child logos vs. community signs vs. household logos) contribute most to literacy learning along this pathway is not known and is in need of further research. Moreover, it is possible that environmental print may play another role in literacy development through more explicit scaffolding of learning experiences within a socio-cultural context.

### **Using Environmental Print to Scaffold Emergent Literacy Skills**

Clay (1991) states that not all children will inevitably go from logographic reading (visual recognition and interpretation of environmental print) to conventional reading by themselves, but require meaningful interactions with an expert to extend upon what they are already attending to in environmental print. From an emergent literacy perspective, this essential “expert” fits well within a Vygotskian (1978) framework in which young children can construct their knowledge about print through real-life and meaningful interactions with an adult, parent, or teacher (Bodrova & Leong, 1998, 2006; Henderson, Many, Wellborn, Ward, 2002; McGee & Purcell-Gates, 1997). Lass (1982) argued that reading skills can develop early in life by helping children identify letters and words and by following the child’s lead and answering questions about the print they discover. Adults may thus help children make sense of environmental print and use it to promote emergent literacy skills by guiding and scaffolding their interactions with it.

Scaffolding refers to the process of using tools or techniques to allow a child to master a skill that would be beyond his or her unassisted efforts (Wood, Bruner, & Ross, 1976). Harste et al. (1984) uses the term “tracking” to refer to the socio-linguistic processes or strategies both child and adult use to actively structure an event and to emphasise the

importance of child-led interactions. These scaffolding tools are gradually removed as children gain mastery of a task. Adult guided interactions may facilitate the child's movement within their zone of proximal development, which is the space between a child's level of mastery with and without assistance (Vygotsky, 1978). For example, by adults pointing out environmental print and individual letters embedded within the print, the child may gradually learn to identify letters themselves without adult assistance (Adams, 1990; McGee & Richgels, 1989; Neumann & Roskos, 1993; Vukelich, 1994). In this way, environmental print scaffolding might be an important tool to foster emergent literacy skills.

The use of environmental print to scaffold emergent literacy development in children has been investigated within a variety of settings. However, relatively little research has specifically explored the parent-child use of environmental print in the home setting during the preschool years (the exceptions being Neumann et al., 2009; Neumann & Neumann, 2010; Neumann & Neumann, in press; Purcell-Gates, 1996; Sinclair & Golan, 2002). The majority of research has been conducted in preschool classrooms. Some researchers have examined the use of environmental print to scaffold literacy development (Kuby & Aldridge, 2004; Rule, Dockstader & Stewart, 2006; Salewski, 1995; Vera, 2007; Wepner, 1985), whereas others have embedded environmental print in play settings in the classroom (Neuman & Roskos, 1993; Vukelich, 1994).

### **Environmental Print use by Parents**

Purcell-Gates (1996) observed the frequency with which 20 low socioeconomic status families used environmental print and other print materials in the home during

everyday experiences over a one-year period. The mean total observation time per family was 34.6 hours over this period. Purcell-Gates reported that the majority of print use in the home was at the word or phrasal/clausal level and involved reading product labels, flyers, coupons, and advertisements (frequency of 0.2 per hour). Children's emergent literacy (alphabet knowledge, writing concepts and concepts about print) was related to the frequency of print-related experiences in the home. Furthermore, direct mother-child interactions around print contributed to children's construction of print knowledge. However, Purcell-Gates concluded that exposure to environmental print does not necessarily lead to conventional reading. Rather, print needs to be pointed out for young children for them to notice it.

Neumann et al. (2009) reported how a mother scaffolded the development of her preschool aged child's alphabet knowledge, early writing, and print motivation by using environmental print coupled with a multisensory approach (based on Neumann, 2007). The multisensory approach aimed to simultaneously stimulate visual, auditory, kinaesthetic and tactile (VAKT) receptors. Multisensory approaches are thought to provide an opportunity for language knowledge to be retained and processed more efficiently by the brain (Henry & Hook, 2006; Moats & Farrell, 2005). Neumann et al's (2009) approach consisted of four steps. For example, during breakfast the mother and child first looked at the environmental print on the milk bottle (visual). Next, they pointed to a letter within the print, saying the letter name and sound (e.g., "An M for Milk makes a mmm sound"; auditory). Then they made the letter shape in the air with their hands (kinaesthetic). Finally, they then traced the letter on the product with their fingers (tactile). The formation of letter shapes was accompanied by directional language (e.g., the mother and child moved their hands in the

shape of an M saying “up, down, up, down”). Neumann et al. (2009) reported that this approach fostered letter name knowledge and also supported the recall of letter shapes and letter formation during the child’s early writing attempts. Due to the case study design used by Neumann et al. (2009), however, further research is required to determine the extent to which these gains were due to the environmental print, multisensory approach or due to other factors.

The use of environmental print combined with a multisensory strategy has also been reported to effectively scaffold a preschool child’s letter shaping, word, and story writing (Neumann & Neumann, 2010). In this study, Roseanna was observed exploring and interacting with environmental print on her own using the print she had found to copy letters and words (e.g., My Little Pony, Mr Happy, Pop Tops). The mother also scaffolded the child’s shaping of environmental print letters and words using the multisensory strategy, for example, as the child traced letters on toy labels and cereal boxes (e.g., Thomas the Tank and Oat Flakes) and in the air (e.g., M for McDonalds). Through Roseanna’s own natural explorations of environmental print and her mother’s environmental print scaffolding the child evidenced her love of reading and writing and intrinsic motivation to learn more about print.

### **Environmental Print use in an Educational Setting**

Nurss (1988) suggested that environmental print can be used within print-rich play settings (e.g., grocery shop) in the classroom so that children can engage in meaningful activities with logos and signs. In this way, young children can learn that print represents oral speech, has value, and can be “figured out” from its context as is consistent with the

logographic reading perspective. She further suggested that environmental print can be used to teach other literacy skills and is better than using isolated letters and sounds (e.g., flashcards) because environmental print adds meaning to the learning experience. Subsequent research on the use of environmental print within a preschool educational setting has provided some evidence of its benefits as a scaffolding tool in enhancing emergent literacy skills.

Two similar studies (Neuman & Roskos, 1993; Vukelich, 1994) found that the presence of trained parents or researchers to guide children in environmental print play settings (e.g., an office setting with signs such as Exit, Open, Closed) facilitated literacy development. Neuman and Roskos assigned 3- to 5-year-old children ( $N = 177$ ) to one of three groups. One group had trained parent helpers who guided environmental print interactions with children, but who did not teach letters or numbers. A second group had parent helpers who were simply observers. A third group experienced normal daily classroom activities. The frequency of children's handling, reading, and writing of environmental print was scored in each of the groups. At the end of the 5-month study, the adult-guided intervention group showed significantly more literacy-related play behaviours and environmental print word reading than the other two groups. Neuman and Roskos concluded that environmental print play settings were a positive tool to guide and stimulate adult-child literacy interactions.

Vukelich's (1994) study differed in that it used 5- to 6-year-olds ( $N = 56$ ), with a shorter 15-week intervention period and used a range of play settings and signs. Examples of environmental print and signs included those in a Restaurant (e.g., No Pets, We're Closed), Post Office (e.g., Mail Box, Tax forms), Shoe Store (e.g., Master Card, Store

Hours), Veterinary Hospital (e.g., Quiet Zone, Waiting Area), and Campsite (e.g., No Swimming, Tent Area). The results showed that guided environmental print interactions with a more knowledgeable adult was the most beneficial condition for increasing a child's ability to read environmental print words in and out of context.

Kuby and Aldridge (2004) extended these studies by directly comparing a play-based approach to a direct instruction approach. They assigned 106 kindergarten-aged children (5- to 6-years old) to receive either no instruction with environmental print, direct instruction, or indirect instruction. Children in the direct instruction groups brought logos from home and the teacher asked them what it was, talked about it, wrote it in standard print, wrote it in a sentence, and finally asked the children to write the logo. For the indirect instruction group, the teacher discussed the meaning of logos that the children brought from home for environmental print-rich play settings then left the children to construct their own understanding via unguided play. At the end of the 8-month intervention, children in the indirect instruction play-based group performed significantly better on environmental print reading tasks (e.g., reading McDonalds, Kmart, Pepsi). Kuby and Aldridge concluded that an indirect play-based approach with environmental print allowed children's learning to be more natural and enjoyable.

In the play-based studies discussed so far, only environmental print reading ability was assessed. Although environmental print reading may promote conventional reading skills via the development of emergent literacy skills, future research is required to provide a broader picture of what effect play-based interactions with print may have on emergent literacy skills. This would require researchers to measure a more comprehensive and wider



set of skills, such as print concepts, alphabet knowledge, phonological awareness, and print motivation.

Other researchers (Wepner, 1985; Salewski, 1995) have taken a more direct approach to using environmental print as an intervention tool than that afforded in play-based settings. Wepner (1985) investigated the use of environmental print logos as tools for beginning reading instruction in preschool children ( $N = 20$ , 3 ½ - and 4 ½ -year-olds). The children were randomly assigned to either an intervention or control group and were pre- and post-tested on print awareness, book handling, logo identification, reading attitudes, and word/sentence identification (e.g., Jessica [child's name] loves Mommy and Daddy). During each 15- to 20-minute session over 8 weeks, the intervention group was introduced to a new logo (e.g., Burger King) and participated in a logo book-making activity. In this activity, children pasted the logos into their books and the instructor wrote and read aloud each child's dictated sentence beside the logo (e.g., Jessica loves Burger King). At post-test, children in the intervention group scored higher on logo identification (20 environmental print items were tested, e.g., Sunmaid Raisins, Dunkin Donuts, Toys R Us, Mobil), print awareness, word/sentence identification, and print motivation than at pre-test and higher than the control group. However, no tests of statistical significance were applied to this data, which makes it unclear whether the improvement was more than would be expected by chance alone.

Salewski (1995) conducted a similar study in which kindergarten children ( $N = 68$ ) were assigned to a control and experimental group. These groups were pre- and post-tested on a 20-item logo test (each logo was presented in full and partial contexts and context free, e.g., Lego, Shell, Safeway, Sun Rype Apple Juice) and Clay's (1979) Word Reading Test.

During eight 30-minute sessions (two sessions/week over 4 weeks) the experimental group was presented with two logos per session and participated in a pocket chart activity (children created sentences related to each logo that were scribed and read aloud by the researcher, and the letters within them were identified) and a journal activity (children glued logos, drew pictures, and wrote sentences). The control group participated in storytelling and related journal activities. Significantly higher post-test scores were found for the environmental print group across all contexts of logo presentation when compared to the control group. Salewski concluded that environmental print instruction helps children develop from being context readers to deciphering print to being graphic-reliant readers (mainly reliant on letters). However, there was no significant difference between groups on the gains made on Clay's Word Reading Test. This suggested that an intervention with logos alone was not enough to move children to conventional word reading. Rather, additional skills such as letter-sound knowledge and the ability to combine and blend phonemes might be required to help a child read conventionally. Nevertheless, Salewski suggested that "while environmental print reading might not naturally lead to conventional reading, it could provide educators with a valuable tool for learning" (p. 33).

Two more recent studies (Rule et al., 2006; Vera, 2007) have provided evidence that environmental print interventions can have a positive effect on emergent literacy. Vera (2007) examined the effects of a 9-week environmental print intervention ( $N = 56$ ) within a pre-kindergarten literacy curriculum. Popular culture environmental print logos familiar to the children (e.g., from cartoon/TV/movie characters, toys e.g., BATMAN, Finding NEMO, Dora) were used to teach alphabet knowledge and print concepts by helping children identify capital letters in the environmental print. The intervention activities

included matching games (e.g., children read the colour logo of “Care Bear”, matched it to a black and white logo, and played with the “Care Bear” toy), matching capital letters to logos, creating logo books, writing or forming beginning letters of logos with play dough, and pointing to environmental print letters and words on a wall. Both the intervention and control groups were introduced to letters each week. However, the control group used children’s and teachers’ names, calendar months, word walls, and individual alphabet letter books. Print concepts were introduced to both groups using big books, pointers and word walls. The control group used grade-relevant readers, whereas the experimental group used the popular culture environmental print. Alphabet knowledge and print concepts were significantly greater in the environmental print intervention group than in the control group at post-intervention showing that environmental print can be used as a tool to enhance emergent literacy skills.

Environmental print might also have the potential to be used during the first years of formal schooling. Rule et al’s (2006) study examined the effect of using environmental print in helping enhance emergent literacy skills in school-aged children at risk of reading failure. They combined environmental print with multisensory activities (visual, kinaesthetic and tactile) to teach phonological awareness and knowledge of letter sounds. Children in Grades 1 to 3 ( $N = 34$ ) who were at risk of reading failure were assigned to either a verbal/kinaesthetic, tactile/object box, or control group (no intervention). The children in the experimental groups participated in 18 hours of their specific literacy activities over a 4-month period. Children in the verbal/kinaesthetic group participated in games such as word bingo or tapping out syllables in words. Children in the tactile/object box group sorted environmental print words (e.g., BUY, THROUGH and FRUIT)

according to number of phonemes, identified letter/vowel combinations, and sorted words by manipulation of small objects. Rule et al. observed that children enjoyed using the environmental print labels to practice discriminating between letters and linking the words to real-world products, which made the activity more meaningful. The experimental groups did not differ on phonological awareness at pre-test, although both were lower than the control group. At post-test, the two experimental groups showed significantly larger gains than the control group (although they were then at a similar level to the control group). These results indicated that environmental print materials plus multisensory methods might be effective early literacy tools to support the teaching of phonological skills in school-aged children in regular and special education classrooms. .

Studies conducted within educational settings have suggested that adult guided print interactions within environmental print-rich play-based settings can enhance environmental print knowledge (Neuman & Roskos, 1993; Vukelich, 1994). Furthermore, it has been shown that environmental print resources that involve direct instruction can improve several aspects of emergent literacy skills like print concepts, phonological awareness, alphabet knowledge, and print motivation not only in preschoolers (Salewski, 1995; Vera, 2007; Wepner, 1985), but also in children who struggle with learning to read in their first years of formal schooling (Rule et al., 2006). The positive findings that have emerged from these studies suggest that teachers should be encouraged to use environmental print as a scaffolding tool to help develop emergent literacy skills.

Furthermore, the more interested a child is in environmental print the more likely they may ask what it means and initiate literacy interactions in both the home and preschool setting (Stanovich & West, 1989; Whitehurst & Lonigan, 1998). Although print motivation

might not be directly linked to formal decoding, encoding or comprehension skills, it might reveal how a child approaches literacy activities in the preschool years, which, in turn, might influence their future acquisition of conventional literacy skills (Baker et al., 1997). In addition, an important influence on a child's print motivation is the nature and type of interactions children have with their parents and teachers during print encounters (Deci, Nezlek, & Sheinman, 1981). These extrinsic factors can encourage or hinder children's emergent literacy learning and motivation (Burns & Casbergue, 1992; Gutman & Sulzby, 2000). Baker et al. (1997) argued that early adult-child encounters and interactions with print greatly influence a child's intrinsic motivation to participate in print related activities. As print motivation is thought to be related to later reading achievement (Baker et al., 1997; Scarborough & Dobrich, 1994) an examination of the relationship between children's logographic reading of environmental print and print motivation would be useful in determining the benefits of environmental in early literacy development.

### **Conceptualising the Role of Environmental Print in Literacy Learning:**

#### **Summary and Directions for Future Research**

The role of environmental print in emergent literacy and reading development that has emerged from the review of the literature is summarised in Figure 1. The potential impact of environmental print begins from birth and is dependent upon normal visual development (Gibson et al., 1962; Glass, 2002). Children are able to construct their own knowledge and increasingly discriminate between visual symbols, colours, and cues in their environment such as the logo of their favourite baby food and learn the meaning of the logo when they hear their mother say, "It's Gerber time". Over time, children will develop a

knowledge bank of environmental print. For example, Harste et al. (1981a) asked 68 children aged 3 to 6 years to identify environmental print items such as Kroger, Milk, Crest Toothpaste, Puffs, JELLO, US Mail and Wendy's. At 3 years of age, children were able to recognise environmental print items in context and provide a meaningful response. For example, a child would say "water" or "Burger King" in response to a "Wendy's" logo on a paper cup. The extraction of meaning from print can become even more refined over time as shown by reports in which children begin to identify individual letters in environmental print (Baghban, 1984; Lass, 1982).

The child's early environmental print experiences are embedded within their daily socio-cultural context and people around them (Goodman, 1986; Harste, 1984; McNaughton, 1995). This has been shown by descriptive reports of young children's interaction with environmental print (Baghban, 1984; Lass, 1982; Lujan & Wooden, 1984; McGee & Richgels, 1989; Neumann et al., 2009; Sinclair & Golan, 2002). In some cases, the child's reading of environmental print is only rudimentary in the sense that it does not correspond to the actual words in the print (e.g., Harste et al., 1981a). Nevertheless, the child is still reading the print for meaning in a way that is relevant to their socio-cultural context. This, in turn, can foster interactions between the child and those around them (see Lass, 1982; Neumann & Neumann, in press; Sinclair & Golan, 2002) and contribute towards their literacy development.

The role of socio-cultural experiences with environmental print in promoting logographic skills is not generally a debated issue (Adams, 1990); what is questioned is whether logographic reading can be considered as part of the reading system and whether logographic skills play a significant role in developing more conventional reading skills. In

logographic reading, we see a child reading environmental print for meaning, even though their ability to extract this meaning greatly diminishes as contextual cues are removed from the text (Masonheimer et al., 1984). A deficit model of reading would see the poorer reading following the removal of contextual cues as reflecting what the child does not know. An alternative view would highlight that the child is beginning to read by using cues to extract meaning from environmental print and that this knowledge can benefit the future acquisition of literacy skills.

The role of environmental print in promoting a transition from logographic skills to emergent literacy skills, and ultimately conventional reading skills, is an area in need of future research. There is some evidence that logographic reading ability is related to the ability to subsequently learn how to read the words out of context (Cronin et al., 1999) and some researchers have reported a relationship between logographic reading and various emergent literacy skills (Lomax & McGee, 1987; McGee et al., 1988; Molfese et al., 2006). Emergent literacy skills (e.g., alphabet knowledge) then lead to conventional reading ability (e.g., Adams, 1990; Snow et al., 1998). Most research in the area has been observational or correlational in nature and future longitudinal research could complement these approaches by being able to trace the role of environmental print in the development from logographic reading skills to emergent literacy skills and to conventional reading skills. The use of eye tracker technology may also reveal what young children are attending to within the graphic displays of environmental print and help determine whether children's early ability to attend to and focus on letter shapes and features within environmental print relates to later reading ability.

The role of environmental print in literacy development may flow through a second parallel pathway in which the learning of emergent literacy skills is scaffolded through socio-cultural experiences. The scaffolding can be done by parents in a home environment or by teachers in an educational context. Moreover, it does not necessarily require the development of specialised play-based environmental print settings because there exists abundant environmental print already in the home (e.g., toy labels, food packaging) and the classroom (e.g., BOYS, GIRLS, EXIT). Mother-child interactions around environmental print may contribute towards some emergent literacy skills, although it may not necessarily lead to conventional reading (Purcell-Gates, 1996). However, evidence from case studies suggests that applying a multisensory strategy to scaffold learning with environmental print will promote emergent literacy skills (Neumann et al., 2009; Neumann & Neumann, 2010). Moving this work beyond a case study design to a large sample of parents and children would help to further validate this approach. More research has been done on using environmental print to teach literacy skills in an educational context. Environmental print may be used to promote the reading of the print in and perhaps out of context (Kuby & Aldridge, 2004; Neuman & Roskos, 1993; Salewski, 1995; Vukelich, 1994) and to promote emergent literacy skills (Rule et al., 2006; Vera, 2007; Wepner, 1985). Findings such as these support the use of environmental print as a literacy learning resource by parents and teachers.

The scaffolding pathway explains how a child's development of emergent literacy skills may be facilitated by someone more expert than them, who is able to provide them with positive feedback and guide their learning within their Zone of Proximal Development (Vygotsky, 1978). For example, this might help a child who is logographically reading



signs and labels to begin to de-contextualise the print embedded in the signs and focus on the letters. In other words, the child's existing logographic skills coupled with scaffolding may be used to support their letter name and sound knowledge.

Further investigation is needed to determine what types of environmental print scaffolding may be the most effective in normally developing children and in children with learning difficulties. For example, Vera (2007) incorporated tactile elements when the children formed letters using play dough. Rule et al. (2006) and Neumann et al. (2009) used a more comprehensive VAKT multisensory approach by including simultaneous visual, auditory, tactile, and kinaesthetic elements. Adult scaffolding of a young child's literacy learning through multisensory interactions with environmental print (by visually pointing out a letter, saying the letter name, tracing the letter shape with a finger and forming the letter shape in the air) might provide an active and meaningful way to learn about letters and words (Neumann et al., 2009; Neumann & Neumann, in press; Rule et al., 2006). This simple strategy may be used in the home or in the classroom through a child's spontaneous encounters with environmental print or could be used in more guided literacy activities. The extent to which this multisensory approach (as opposed to the use of environmental print alone) affects growth of emergent literacy skills is an important factor to investigate.

Reading acquisition may be conceptualised as existing along a developmental continuum (Mason & Allen, 1986). The process can be cyclic, where experience transacts with print settings and leads to new levels of literacy growth with prior experiences continually influencing future experiences (Harste et al., 1984). The idea that emergent literacy skills and logographic skills cycle back to socio-cultural experiences is in keeping with this perspective (see Figure 1). The cycle continues during a child's natural discovery

of environmental print and subsequent acquisition of more sophisticated understandings of socio-culturally determined concepts of print. For example, Lass (1982) described how during walks along a commercial street, her son at 20 months of age explored and pointed out letters in surrounding signs asking his mother what they were. Through the positive feedback from his mother, Jed's knowledge of alphabet letters and words gradually increased. For the purposes of this review, most focus has been placed on logographic and emergent literacy skills. However, the process will continue even when children master conventional reading as socio-cultural experiences will continue to shape literacy learning throughout our adult lives. Harste et al. (1984) puts this into perspective by saying "Because this process is cyclic and ongoing throughout life, the nature of literacy itself is forever changing, creating new personal and societal potentials for all of us" (p. 30).

### **Conclusion**

Many children have a natural attraction to environmental print. Lujan and Wooden (1984), for example, observed two toddlers aged 17 and 18 months. Following presentations of food-related environmental print items in context (e.g., Doritos bag, Hershey's wrapper), the children responded by looking at the environmental print, verbally labelling the item, pointing at the label, and reaching for and focusing on the stimulus. Similarly, Neumann and Neumann (in press) described how 2-year-old James enjoyed taking walks with his mother as he pointed to environmental print words (e.g., HYUNDAI on a large bull dozer digging in his front yard) and letters (e.g., a letter S on a power pole identification label (S P 42 10 897) during daily activities. Parents and early childhood educators would be well served by capitalising on children's attraction to environmental print by using it to promote their reading development. Environmental print may also have

applications in other early literacy activities. For example, recent case studies have reported how environmental print may scaffold children's early writing (Chan, Zi Juan, Lai Foon, 2008; Neumann & Neumann, 2010).

The present review suggests that environmental print can play an important role in a child's literacy development. From the reviewed research, interactions with environmental print in the child's socio-cultural context will develop their logographic reading skills. These skills, in turn, will promote emergent literacy skills and conventional reading skills. Environmental print may also be used more directly when adults use it to scaffold the development of emergent literacy skills. In this way, parents and educators will enhance children's own natural exploration of print in their world. A montage of many types of early encounters with environmental print will no doubt individually shape children's literacy experiences as they follow different pathways along the road to conventional reading (Clay, 1998). Clay (1991) emphasized the benefits of fostering a child's natural internal interest in environmental print to facilitate emergent literacy development. Using environmental print scaffolding to foster children's already existing knowledge of print awareness and letter knowledge and their print motivation could benefit children prior to school as well as potentially benefiting reading development after commencing school.

## References

- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT press.
- Aram, D., & Levin, I. (2002). Mother-child joint writing and story book reading: Relations with literacy among low SES kindergarteners. *Merrill-Palmer Quarterly*, 48, 202-224.
- Baghban, M. (1984). *Our daughter learns to read and write: A case study from birth to three*. International Reading Association: Newark Delaware.
- Baker, L., Scher, D., & Mackler, K. (1997). Home and family influences on motivations for reading. *Educational Psychologist*, 32, 69-82.
- Bastien-Toniazzo, M., & Jullien, S. (2001). Nature and importance of the logographic phase in learning to read. *Reading and Writing: An Interdisciplinary Journal*, 14, 119-143.
- Bedrova, E., & Leong., D. J. (1998). Scaffolding emergent writing in the Zone of Proximal Development. *Literacy Teaching and Learning*, 3, 1-18.
- Bedrova, E., & Leong., D. J. (2006). Vygotskian perspectives on teaching and learning early literacy. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research: Vol. 2*. (pp. 243-256). New York: Guildford Press.
- Beech, J. R. (2005). Ehri's model of phases of learning to read: a brief critique. *Journal of Research in Reading*, 28, 50-58.

- Blair, R., & Savage, R. (2006). Name writing but not environmental print recognition is related to letter-sound knowledge and phonological awareness in pre-readers. *Reading and Writing, 19*, 991-1016.
- Bowman, M & Treiman, R. (2004). Stepping Stones to Reading. *Theory into Practice, 43*, 295-303.
- Burns, M.S., & Casbergue, R. (1992). Parent-child interaction in a letter-writing context. *Journal of Reading Behaviour, 24*, 289-312.
- Chan, L., Zi Juan, C., & Lai Foon, C. (2008). Chinese preschool children's literacy development: from emergent to conventional writing. *Early Years, 28*, 135-148.
- Clay, M. M. (1979). *The early detection of reading difficulties*. Portsmouth, NH: Heinemann.
- Clay, M. M. (1991). *Becoming literate: The construction of inner control*. Auckland: Heinemann.
- Clay, M. M. (1993). *An observation of early literacy achievement*. Portsmouth NH: Heinemann.
- Clay, M. M. (1998). *By different paths to common outcomes*. Maine: Stenhouse.
- Coldren, J. T., & Haaf, R. A. (2000). Asymmetries in infants' attention to the presence or absence of features. *The Journal of Genetic Psychology, 161*, 420-434.
- Cloer, T., Alderidge, J., & Dean, R. M. (1981/1982). Examining different levels of print awareness. *Journal of Language Experience, 4*, 25-33.

- Cronin, V., Farrell, D., & Delaney, M. (1999). Environmental print and word reading. *Journal of Research in Reading, 22*, 271-282.
- Deci, E. L., Nezlek, J., & Sheinman, L. (1981). Characteristics of the rewarder and the intrinsic motivation of the rewardee. *Journal of Personality and Social Psychology, 40*, 1-10.
- De Loache, S. (2004). Becoming symbol-minded. *Trends in cognitive sciences, 8*, 66-70.
- Dickinson, D. K., & Snow, C. E. (1987). Interrelationships among prereading and oral language skills in kindergarteners from two social classes. *Early Childhood Research Quarterly, 2*, 1-25.
- Ehri, L. C. (1995). Phases of development in learning to read words by sight. *Journal of Research in Reading, 18*, 116-125.
- Ehri, L. C. & McCormick, S. (1998). Phases of word learning: Implications for instruction with delayed and disabled readers. *Reading and Writing Quarterly, 14*, 135-163.
- Ehri, L. C., & Roberts, T. (2006). The roots of learning to read and write: Acquisition of letters and phonemic awareness. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research vol 2* (pp. 113-130). New York: Guildford Press.
- Fantz, R.L. (1961). The origin of form and perception. *Scientific American, 204*, 66-72.
- Ferguson, N. (1975). Pictographs and prereading skills. *Child Development, 46*, 786-789.

- Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. Patterson, J. Marshall & M. Coltheart (Eds.), *Surface dyslexia: Neuropsychological and cognitive studies of phonological reading*. (pp. 301-330). London: Erlbaum.
- Frith, U. (1986). A developmental framework for developmental dyslexia. *Annals of Dyslexia*, 36, 69-81.
- Gibson, E. J., Gibson, J. J., Pick, A. D., & Osser, H. (1962). A developmental study of the discrimination of letter-like forms. *Journal of Comparative and Physiological Psychology*, 55, 897-906.
- Glass, P. (2002). Development of the visual system and implications for early intervention. *Infants and Young Children*, 15, 1-10.
- Goodall, M. (1984). Can four year olds “read” words in the environment? *Reading Teacher*, 37, 478-482.
- Goodman, K. S., & Goodman, Y. M. (1979). Learning to read is natural. In L. B. Resnick and P. A. Weaver (Eds.), *Theory and Practice of early reading*, (pp. 137-154). Hillsdale, NJ: Erlbaum Associates.
- Goodman Y. M., & Altwerger, B. (1981). *Print awareness in preschool children: A study of the development of literacy in preschool children*. Occasional Paper, Program in Language and Literacy. Tuscon, AZ: University of Arizona.
- Goodman, Y. M. (1986). Children coming to know literacy. In W. H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (1-14). Norward, NJ: Ablex.

- Gutman L. M., & Sulzby, E. (2000). The role of autonomy-support versus control in the emergent writing behaviours of African-American kindergarten children. *Reading Research and Instruction, 39*, 170-184.
- Hall, N. (1987). *The emergence of literacy*. London: Hodder & Stoughton.
- Harste, J. C., Burke, C. L. & Woodward, V. A. (1981a). Children, their language and world: Initial encounters with print. (Final Report # NIE-G-79-0132). Bloomington, IN: Language Education Departments Indiana University (p 1-618).
- Harste, J. C., Burke, C. L. & Woodward, V. A. (1981b). Examining our assumptions: A transactional view of literacy and learning. *Research in the teaching of English, 18*, 84-108.
- Harste, J. C., Woodward, V. A., & Burke, C. L. (1984). *Language stories and literacy lessons*. Portsmouth, NH: Heinemann.
- Harste, J. C., & Woodward, V. A. (1989). Fostering needed change in early literacy programs. In D. S. Strickland & L. M. Morrow (Eds.). *Emerging literacy: Young children learn to read and write* (pp. 147-159). Newark, DE: International Reading Association.
- Henderson, S. D., Many, J. E., Wellborn, H. P., & Ward, J. (2002). How scaffolding nurtures the development of young children's literacy repertoire: Insiders' and outsiders' collaborative understandings. *Reading Research and Instruction, 41*, 309-330.



- Henry, M. K., & Hook, P. (2006). Multisensory instruction: Then and now. *Perspectives: The International Dyslexia Association*, 32, 9-11.
- Hiebert, E. H. (1978). Preschool children's understanding of written language. *Child Development*, 49, 1231-1234.
- Horner, S. L., (2005). Categories of environmental print: All logos are not created equal. *Early Childhood Education Journal*. 33, 113-119.
- Johnson, M.H. (2005). *Developmental Cognitive Neuroscience*. Blackwell:Oxford.
- Kassow, D. Z. (2006). Environmental print awareness in young children. *Talaris Research Institute*, 1, 1-8.
- Korat, O. (2005). Contextual and non-contextual knowledge in emergent literacy development: A comparison between children from low SES and middle SES communities. *Early Childhood Research Quarterly* 20, 220-238.
- Kuby, P., Goodstadt-Killoran, I., Aldridge, J., & Kirkland, L. (1999). A review of research on environmental print. *Journal of Instructional Psychology*, 26, 173-182.
- Kuby, P., & Aldridge, J. (2004). The impact of environmental print instruction on early reading ability. *Journal of Instructional Psychology*, 9, 106-114.
- Lass, B. (1982). Portrait of my son as an early reader. *The Reading Teacher*. 36, 20-28.

- Lomax, R. G., & McGee, L. M.. (1987). Young children's concepts about print and reading: Toward a model of word reading acquisition. *Reading Research Quarterly*, 22, 237-256.
- Lujan, M. E & Wooden, S. L. (1984). An exploration of environmental correlates of early childhood literacy. (Report No. PS 015 101). New Mexico: New Mexico State University. (ERIC Document Reproduction Service No. ED 258 696.
- Mason, J. M. (1980). When do children begin to read: an exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly*, 15, 203-227.
- Mason, J. M., & Allen, J. (1986). A review of emergent literacy with implications for research and practice in reading. *Review of Research in Education*, 13, 3-38.
- Masonheimer, P. E., Drum, P. A., & Ehri, L. C. (1984). Does environmental print identification lead children into word reading? *Journal of Reading Behaviour*, 16, 257-271.
- McGee, L. M., Lomax, R.G., & Head, M. H. (1988). Young children's written language knowledge: What environmental print and functional print reading reveals. *Journal of Reading Behaviour*, 20, 99-118.
- McGee, L. M. & Richgels, D. J. (1989). "K is Kristen's": Learning the alphabet from a child's perspective. *The Reading Teacher*, 43, 216-225.
- McGee, L. M. & Purcell-Gates, V. (1997). "So what's going on in research on emergent literacy?" *Reading Research Quarterly*, 32, 310-318.

- McNaughton, S. (1995). *Patterns of emergent literacy: Processes of development and transition*. Melbourne: Oxford University Press.
- McNaughton, S. (2006). Considering culture in research-based interventions to support early literacy. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research: Vol. 2*. (pp. 229-240). New York: Guilford Press.
- Moats, L. C & Farrell, M. L. (2005). Multisensory structured language education. In J. R. Birsch (Ed.), *Multisensory teaching of basic language skills (pp. 23-41)* (2<sup>nd</sup> ed.) Maryland: Paul H. Brookes.
- Molfese, V. J., Modglin, A. A., Beswick, J. L., Neamon, J. D., Shelby, S. A., Berg, J., & Molnar, A. (2006). Letter knowledge, phonological processing and print knowledge. *Journal of Learning Disabilities*, 39, 296-305.
- Neuman, S. B., & Roskos, K. (1993). Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal*, 30, 95-122.
- Neumann, M. M. (2007). *Up Downs: A fun and practical way to introduce reading and writing to children aged 2-5*. Sydney: Finch.
- Neumann, M. M., Hood, M., & Neumann, D. L. (2009). The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal*, 36, 313-319.

- Neumann, M. M., & Neumann, D. L. (2010). Parental strategies to scaffold emergent writing skills in the preschool child within the home environment. *Early Years: An International Journal of Research and Development, 30*, 79-94.
- Neumann, M. M., & Neumann, D. L. (in press). The role of idiomorphs in emergent literacy. *Childhood Education*.
- Nurss, J. (1988). "I can read that": Using logos in the early childhood classroom. ERIC Document Reproduction Service No. ED319535. (Retrieved from <http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet>, Accessed 27-7-09)
- Purcell-Gates, V. (1996). Stories, coupons, and the TV guide: Relationships between home literacy experiences and emergent literacy knowledge. *Reading Research Quarterly, 31*, 406-428.
- Prior, J., & Gerard, M. (2004). *Environmental print in the classroom: Meaningful connections for learning to read*. Newark, DE: International Reading Association.
- Reutzel, D. R., Fawson, P. C., Young, J. R., Morrison, T. G., & Wilcox, B. (2003). Reading environmental print: What is the role of concepts about print in discriminating young readers' responses? *Reading Psychology, 24*, 123-162.
- Riley, J. L. (1996). The ability to label letters of the alphabet at school entry: A discussion on its value. *Journal of Research in Reading, 19*, 87-101.
- Ritchey, K. D. (2008). The building blocks of writing: Learning to write letters and spell words. *Reading and Writing, 21*, 27-47.

- Rule, A. C., Dockstader, C. J., & Stewart, R. A. (2006). Hands-on and kinesthetic activities for teaching phonological awareness. *Early Childhood Education Journal*, 34, 195-201.
- Salewski, W. C. (1995). *The effect of environmental print reading on the literacy development of kindergarten children*. Unpublished Master's Dissertation, The University of British Columbia, Vancouver Canada. (Retrieved from [https://circle.ubc.ca/bitstream/2429/3660/1/ubc\\_1995-0145.pdf](https://circle.ubc.ca/bitstream/2429/3660/1/ubc_1995-0145.pdf). Accessed 27/7/2009).
- Scarborough, H. S., & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review*, 14, 230-245.
- Share, D. L. & Gur, T. (1999). How reading begins, a study of preschoolers' print identification strategies. *Cognition & Instruction*, 17, 177-213.
- Sinclair, A., & Golan, M. (2002). Emergent literacy: a case-study of a two-year-old. *Early Child Development and Care*, 172, 555-572.
- Snow, C. E., Burns, S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Stanovich, K. E., & West, R. F. (1989). Exposure to print and orthographic processing. *Reading Research Quarterly*, 24, 402-433.
- Treiman, R., Cohen, J., Mulqueeny, K., Kessler B., & Schechtman, S. (2007). Young children's knowledge about printed names. *Child Development*, 78, 1458-1471.

- Vera, D. (2007). *The use of popular culture environmental print to increase the emergent literacy skills of prekindergarten children in one high-poverty urban school district*. Unpublished doctoral dissertation, Texas A & M University, Texas. (Retrieved from <http://proquest.umi.com.libraryproxy.griffith.edu.au/pqdweb> Accessed 22/3/09).
- Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early Childhood Research Quarterly*, 9, 153-170.
- Vukelich, C., Christie, J., & Enz, B. (2008). *Helping young children learn language and literacy: Birth through kindergarten*. Boston: Pearson.
- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.
- Wepner, S. B. (1985). Linking Logos with print for beginning reading success. *The Reading Teacher*, 38, 633-639.
- Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, 69, 848-872.
- Wood, D., Bruner, J. C., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, 17, 89-100.
- Yamagata, K. (2007). Differential emergence of representational systems: drawings, letters and numerals. *Cognitive Development*, 22, 244-257.

## Chapter 3 Prelude

### The Scaffolding of Emergent Literacy Skills in the Home Environment:

#### A Case Study (Study 1)

The Chapter 2 review showed that environmental print can play an important role in a young child's literacy development. Existing research indicated that interactions with environmental print in the child's socio-cultural context will develop their logographic reading skills (Baghban, 1984; Goodman, 1986; Harste, Burke & Woodward, 1981). These skills, in turn, may promote emergent literacy skills and conventional reading skills (Cronin, Farrell, & Delaney, 1999; Lomax & McGee, 1987). It also showed that environmental print may be used more directly such as when parents use it to scaffold children's development of emergent literacy skills (e.g., McGee & Richgels, 1989). In this way, parents can enhance children's own natural exploration of print in their world and foster children's emerging print awareness, letter knowledge, and print motivation (Otto, 2008). Clay (1991) emphasized the benefits of fostering a child's natural internal interest in environmental print to facilitate emergent literacy development. Preschool and kindergarten based studies showed that environmental print may be used to promote emergent literacy skills (Prior, 2003; Salewski, 1995; Vera, 2007; Wepner, 1985).

Case Study 1, which has been published in the *Early Childhood Education Journal* details how a mother used daily environmental print experiences and interactions to scaffold her preschool child's understanding that environmental print is functional and meaningful and consists of letters that have particular names, shapes, and sounds. Specifically, the mother used directional language to help "Harry" shape his letters when writing at home and encouraged him to trace print on product labels he encountered daily

with his fingers and form letter shapes in the air. This multisensory approach involved the simultaneous stimulation of visual (look and point at the environmental print), auditory (say and hear the letter name and sound), kinaesthetic (hand movements of the letter shape in the sky), and tactile (trace the letter on the label) receptors. Through these guided experiences with print “Harry” began to initiate his own interactions with environmental print that were personally meaning to him through pointing out letters and copying environmental print words. This study provides evidence that parent-child use of environmental print in the home involving innovative strategies utilizing environmental print has the potential to foster emergent literacy prior to school.



**Statement of contribution to Chapter 3 co-authored published paper**

**Neumann, M. M., Hood, M., & Neumann, D. L. (2009). The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal*, 36, 313-319.**

This chapter includes a co-authored paper. The bibliographic details of the co-authored paper, including all authors, are: Michelle. M. Neumann, Dr Michelle Hood, Associate Professor David Neumann.

My contribution to the paper involved the literature review, data collection, data analyses, and writing of the review paper. The co-authors provided review of drafts.

Name of Student: Michelle Neumann

(Signed)

Corresponding authors of published paper:

Name of Corresponding Authors:

(Countersigned) Dr Michelle Hood

(Countersigned) Associate Professor David Neumann

(Countersigned) Dr Michelle Hood

Supervisor: Name of Supervisor

## **Chapter 3**

### **The Scaffolding of Emergent Literacy Skills in the Home Environment:**

#### **A Case Study**

Michelle M. Neumann, Michelle Hood, & David L. Neumann

School of Psychology, Griffith University

Corresponding author and address: Michelle. M. Neumann, Michelle Hood, School of Psychology, Griffith University (Gold Coast Campus), Mail: GRIFFITH UNIVERSITY QLD, Queensland, 4222, Australia, E-mail: michelle.hood@griffith.edu.au, Facsimile +61(0)7 5552 8291, Telephone +61(0)7 5552 8421

### **Abstract**

The ways in which parent-child interactions can encourage the development of emergent literacy skills in young children remains to be fully explored. The present report describes how one parent scaffolded her young child's emergent writing and letter knowledge in the home. Environmental print provided many rich and meaningful examples for the parent to show that print conveys meaning and is constructed with letters that have names and make sounds. The parent used idiomorphs, a multisensory approach incorporating the tracing of letters and whole body movements, and common household objects to guide the child's learning of letter names, sounds, and shapes. Emergent writing skills were scaffolded by using directional language and by the child copying environmental print. The strategies and examples that are described may give guidance to parents and teachers on how to provide engaging opportunities for literacy learning in the home environment or in an early educational context.

*Keywords:* emergent writing skills; alphabet knowledge; print motivation; scaffolding; parent-child interaction; multisensory learning; environmental print.

### **The Scaffolding of Emergent Literacy Skills in the Home Environment: A Case Study**

Parents can play a key role in fostering positive early learning opportunities that have an important impact on their child's emergent literacy skill development prior to school entry (Ehri & Roberts, 2006; Saracho, 1997). While many parents engage in daily storybook reading with children, formal literacy teaching is more relevant in children's literacy acquisition (Hood, Conlon, & Andrews, 2008). Recently, joint writing activities have also been found to be more effective than storybook reading in facilitating the development of emergent literacy skills in young children (Aram & Biron, 2004; Ritchey, 2008). However, far fewer parents engage preschool children in these types of interactions (Wood, 2002). This suggests that parents may benefit from information on simple literacy teaching strategies and activities that they can confidently implement in the home and which will foster the development of literacy skills.

Vygotsky's (1978) socio-cultural perspective provides a natural framework within which to view parent-child literacy interactions. Within each literacy interaction parents can provide enough guided participation as is necessary to scaffold the child's movement within their zone of proximal development. *Scaffolding* refers to the use of tools or techniques to allow a child to achieve a goal that would otherwise be beyond his or her unassisted efforts (Wood, Bruner, & Ross, 1976). The techniques of materialization and private speech provide examples of how scaffolding can be applied in a literacy activity (Bodrova & Leong, 1998). Materialization refers to the use of concrete objects or actions to represent a concept. Private speech refers to a child providing their own audible instructions during a challenging task. In a case study of 5 year old kindergarten children, Bodrova and Leong showed that drawing lines to represent units of speech in written form

(materialization) and encouraging the rereading aloud of what had been written to prompt the words the child had planned to write next (private speech) helped them to move within their zone of proximal development. Furthermore, Aram and Levin (2002) found that when mothers used guided participation (e.g., word segmenting, retrieval of letter shapes and printing) during joint writing activities with their kindergartner children there was a positive effect on the child's word writing and recognition and phonological awareness.

A scaffolding approach can also be facilitated by the use of educational materials designed to teach literacy skills. However, there might be significant advantages to parents by making use of *environmental print*. Young children are aware from an early age that environmental print, such as product labels, clothing, road signs, and advertisements, communicates meaning (Kuby, Goodstadt-Killoran, Aldridge & Kirkland, 1999). The use of environmental print during parent-child interactions thus provides a meaningful way to expose children to literacy concepts like letter shapes and letter sounds (Elliot & Olliff, 2008). The ubiquitous nature of environmental print can give the parent and child many opportunities for spontaneous learning experiences. Moreover, environmental print may encourage parent-child interactions to be more informal and eliminate the need for the parent to purchase or prepare any special educational materials.

The present report describes how a mother scaffolded her child's emergent literacy skills prior to school entry. The descriptions are predominantly focused on the scaffolding methods used by the mother and how they were elicited by environmental print. In addition to the learning of letter shapes and sounds, we describe the child's writing development. In recent years, attention has shifted towards the important role of writing activities in facilitating the development of emergent literacy skills in young children (Ritchey, 2008;

Mayer, 2007). Joint writing activities, for example, have been shown to be more effective in enhancing children's emerging skills in phonological awareness, letter knowledge, word writing, and orthographic awareness than story book reading (Aram & Biron, 2004). Through early writing activities such as drawing and forming letter shapes in a variety of ways, children are able to increase their awareness and use of print, which, in turn, encourages them to examine their writing and ask "what does this say?" (Clay, 1975).

### **Description of the Child**

Harry was from a middle income family. Both parents (first and third authors) had tertiary education and professional occupations. Family SES using the Hollingshead 4-factor index (Hollingshead, 1975) was 59.5 (maximum score = 66). Harry's cognitive and physical development was normal. Harry did not experience any letter drills, phonetic instruction, or formal reading teaching prior to school entry.

### **Parent-Child Interactions and Strategies**

The mother made anecdotal notes of parent-child dialogue during selected guided literacy and joint-writing interactions with Harry from when he was 2 years old until he commenced school at 6 years of age. It was not possible to record every single literacy interaction due to the spontaneous nature of these interactions; however, those recorded were indicative of the general nature of these interactions. The information collected was collated and examined to determine the common techniques used by the mother, to provide examples of the types of environmental print encountered, and to provide representative samples of Harry's writing development and the dialogue that occurred between the mother and child.

### **Discovering print and understanding that it has meaning**

Harry was introduced to print from 2 years of age through an informal approach that was spontaneously elicited by encounters with environmental print. Piaget (as cited in Biehler & Snowman, 1997) argued that children at this age can begin to attach oral words and symbols to physical objects. Typical examples of the environmental print used were signs; labels on food packaging; brand names on objects; text and labels on clothing; and written materials (e.g., shopping list). In addition, because environmental print is relatively stable (e.g., a STOP sign does not move and the label on the child's favourite food packaging stays the same each week), Harry was provided with many repetitive and advantageous opportunities to engage with the same print and learn about the letters and words in a meaningful way (Kuby et al., 1999). Adams (1990) argued that children may learn to separate print from its non-print context through such repeated engagements with environmental print.

When Harry was 2 years of age, the mother initiated interactions that focused on scaffolding his ability to differentiate print from pictures and photos on environmental print. One such example occurred when the mother was making Harry a chocolate milk drink using the chocolate powdered product Milo. The mother pointed to the print and said "Look, that says Milo. Look at the 'MMM' for Milo it goes up, down, up down" while tracing the letter M with her fingers. She asked Harry where the cup was on the food packaging. He pointed to the picture of the cup enthusiastically saying "cup". The mother pointed to the print again running her finger under the letters and said, "There's the letter M for Milo", then they both pointed to the letter and then the mother pointed and said "Look there's an 'O'. It goes around and around like the wheels of a car." Harry and his mother

moved their arms around and around in the air in the shape of the letter O. These types of print identification interactions were repeated on a daily basis and strengthened Harry's print awareness and motivation to explore letters further.

From 2 ½ years of age, Harry began to point out environmental print spontaneously, suggesting that he enjoyed interacting with his mother about environmental print and had learnt to distinguish print from non-print. This differentiation of print and pictures extended to the exploration of story books. For instance, Harry pointed to text in a book and said "up downs" then pointed to pictures and labeled them verbally and correctly. Harry said "Look dog!" when referring to the picture of a dog then pointed to the corresponding page of print and said "up downs!" As this example shows, the mother and child used the term *up downs* to refer to print during interactions (Neumann, 2007). The term functioned as an idiomorph (Otto, 2008) when Harry did not know what the print "said" but knew it was print rather than pictures. Consistent with Vygotsky's (1978) theories of scaffolding and use of language as a learning tool, the idiomorph allowed Harry to communicate with his mother about print from an early age, until he became more familiar and able to articulate the verbal labels of print (such as letter and number names). After 4 years of age, the scaffolding "up downs" term was no longer needed as Harry had become familiar with most letter names and could use those to refer to print.

### **Learning about letter names, shapes, and sounds**

After Harry was able to differentiate environmental print from pictures and understood that print had meaning, the mother focused on individual letters within the print. Exposure to some relevant environmental print prompted the child or mother to point out



the print. Thus, interactions were both parent-initiated (e.g., “What does this say?”) and child-initiated (e.g., “What dis [sic] say?”). Once both mother and child were oriented towards the discovered print, its meaning was pointed out by the mother (e.g., “This says Weetbix. You are eating yummy Weetbix for breakfast.”). Finally, the mother examined the individual letters. She tended to focus on capital letters. Adams (1990) noted that capital letters are easier than lower-case letters to visually recognize and differentiate from one another and their shapes are easier to physically form. Also, letters on accessible environmental print (e.g., on cereal boxes, posters or signs) were mostly large and upper case.

The mother used a multisensory approach to scaffold the learning of letter shapes. Such an approach can lead a child to process and retain language knowledge more efficiently (Moats & Farrell, 2005). In one of the earliest recorded applications of multisensory learning, Orton (1928, cited in Birsh, 2005) asked children to trace the letters in words with their finger whilst the word was pronounced. In addition to the tactile tracing of letters, the mother engaged the child’s visual, auditory, and kinesthetic senses. For the visual sense, the mother encouraged Harry to look at and point to the environmental print (e.g., “Look, Harry, it says *MILK*” while pointing to the label on a milk bottle). For the auditory sense, the child listened to the mother saying the word and making the sound of the first letter (e.g., “That’s the letter *M* for *MILK*. The letter *M* makes a *MMM* sound”). The child was encouraged to say the word, the letter name, and to make its sound. The mother also talked about other words that started with the same letter in order to foster Harry’s phonetic awareness and letter name knowledge (e.g., “M is also for Mouse and Moon”). For the kinesthetic sense, Harry was encouraged to move his arm and hand in the

shape of the letter as a way to link physical activity to writing. The mother verbally guided the child through the motions by using the terms “up”, “down”, “around”, and “across” as appropriate (e.g., “*M* for *MILK* goes up, down, up, down” while making the shape of the letter in the air). These directional terms were familiar to the child due to general daily interactions, stories, and nursery rhymes (e.g., Jack and Jill went *up* the hill). The same directional terms were also used later when Harry was drawing and writing. Finally, for the tactile sense, the mother encouraged Harry to trace the letter shapes on the environmental print with his finger (e.g., traced the letter *M* on the milk bottle).

The interactions between the mother and child that began with environmental print also transferred to other contexts. During playtime, the mother encouraged Harry to trace plastic and magnetic letters whilst saying aloud the directions of the lines that formed the letter shapes (up, down, across, and around). Harry was also encouraged to form letter shapes when playing with modelling clay or making cookie dough. He initiated many letter forming activities himself by using food when eating or playing with household materials. For example, Harry made the letter E out of fish fingers, he broke a donut in half and exclaimed that he had made a “C for cat”, he made a V from fallen tree branches in the garden and was excited when he made a round “O for octopus” out of some old string he had found. Thus, Harry’s motivation for print was fostered during joint parent-child interactions, but he himself extended these episodes in his own play, utilizing the same speech his mother had previously used. This indicated the value of the initial scaffolding and private speech that the mother provided in assisting Harry to internalise and self-guide his own play with letters and print. During joint story book reading, Harry was encouraged to point out letters that went up, down, around and across (e.g., “F for Fish goes down,

across and across”) and to trace them with his finger saying the directions, then signing the letter shapes in the air.

During the period that this report describes, a page containing a printed list of upper-case alphabet letters in Century Gothic font size 72 was used to assess Harry’s letter name and sound knowledge at regular intervals. The mother pointed to the letters in random order and asked Harry the name and sound of the letter. Harry correctly named 16 letters at 3 ½ years, 19 letters at 4 ½ years, and 20 letters at 6 years. Harry’s letter-sound knowledge was 11 letter sounds at 5½ years and 15 letter sounds at 6 years of age.

### **Joint writing strategies**

From as soon he was able to grasp a crayon, Harry was provided with many opportunities to scribble and draw. At 2 ½ years of age, Harry was encouraged to draw large up, down, around and across movements on a vertical chalk board. This pre-writing gross motor activity helped Harry link these physical experiences with his previous encounters with environmental print where he had visually explored and physically traced vertically positioned letters using directional language (up, down, around, and across). At 3 years of age this activity was transferred to drawing these line shapes on paper positioned horizontally facilitating his fine motor control development. Writing samples were collected throughout Harry’s development. Examples are presented in Figure 1 in order to show Harry’s development at specific ages (2½, 3½, 4½, 5½ and 6 years of age) and to illustrate some of the key outcomes of the approach that was used. As the samples indicate, Harry progressed through the normal stages of writing development. In some cases, however, the developmental milestones appeared to occur slightly earlier and were more

controlled than the age ranges indicated in Baghban's (2007) stages of writing development.



*Figure 1.* Writing examples showing Harry's writing development through scaffolding during parent-child interactions. At 2½ years, Harry drew controlled lines that went up, down, around, and across. At 3½ years, Harry drew recognizable letters under guidance from the parent on the types of movements required for each letter (e.g., "round-and-round goes the letter O"). At 4½ years, Harry wrote "STOP! WE ARE FINISHED" through parent scaffolding of each letter and used finger spacing between words. At 5½ years, Harry drew a picture and asked the parent how to write "SCARY MONSTER". The parent stated each letter in sequence that was required for the correct spelling and scaffolded the formation of the more difficult letters (e.g., letter R). At 6 years, Harry was able to write letters, words, and sentences conventionally without parent mediation.

At 2½ years, when controlled scribbling is normally evident (Baghban, 2007), Harry's mother scaffolded the marks he made by using the directional terms of "up", "down", "across", and "around". As can be seen in Figure 1, this assisted Harry to produce scribbling that approximated some letters (e.g., A, T, M, and O). By 3½ years of age, these scaffolded interactions resulted in Harry being able to independently draw 7 simple letters that went up, down, around and across (e.g., O, T, and M) as well as his name (see Figure 1 for examples). Scaffolding then focused on more complex letters (e.g., R and P) that were currently in Harry's zone of proximal development. He was also able to draw an S because he had been encouraged to "slide your finger down the snakey letter S" as he traced it with his finger on environmental print such as on a sultana packet or in a story book. Similar to the focus on capital letters when identifying letters in environmental print, the scaffolding of letter formation by the mother also focused on capital letters.

At 4½ years of age, Harry was able to write most of the alphabet letters on request. If he was unsure of how to write a specific letter his mother would scaffold his letter formation using directional instructions. For example, the mother would say "Can you write 'A' for apple. Remember it goes up, down, and across". In order to further incorporate multisensory learning, Harry would first sign it in the air with his mother before independently writing it on paper whilst using the private speech provided earlier by his mother ("up, down, around, and across"). Harry was also able to write whole words and sentences using this scaffolded strategy. For example, after completing a joint writing activity (making an alphabet book) Harry wrote "Stop! We are finished" (Figure 1). In writing this, his mother spelt out the letters of each of the words and, for those letters that

Harry requested help to write (e.g., the letter “R”), used the directional terms to scaffold his writing (e.g., “up, down, around and across”).

By 5½ years, Harry was showing evidence of independent writing of letter strings with no correspondence to real words (pre-phonetic spelling). In addition, the scaffolding strategy was continued by using the directional terms to guide Harry when writing words. Harry appeared to generalize this approach to numerals that he encountered in environmental print. For example, Harry would say the directions of the number shapes (e.g., “7 goes across and down”) as he wrote them. Harry now formed the idea of what text he wanted to write and asked his mother for guidance on spelling. The dialogue between the mother and child that led to the writing shown in Figure 1 at 5½ years of age was as follows:

Harry: *How do you write “MONSTER”?*

Mother: *An M for MMMonster goes up, down, up, down. [Harry drew the M]. An O comes next.*

Harry: *It goes around like the wheels of a car [Harry utilised his own self-guiding private speech to accurately draw the letter O]*

Mother: *An NNN for nut comes next – it goes up, down, up [Harry drew the letter N]. Then an S for snake [Harry made an SSS sound and drew the letter]. Remember to slide your pencil down Mr Snake’s back. Then a T for Toy tuh, tuh, tuh.*

Harry: *It goes down and across [He directionally signs the letter in the air with his arm then drew it on paper].*

Mother: *Then an E for ...*

Harry: *Egg – I know – it goes down across, across and across [He drew the letter].*

Mother: *Then the last letter is an RRR for Rabbit. It’s the tricky one. It goes down, around and down. Let’s write it in the air. [He drew the letter in the air and then on paper]*

Mother: *That’s great writing – you wrote the word “MONSTER”! Let’s read it together.*

By 6 years of age, Harry evidenced phonetic spelling by saying the sound of letters in words and writing them down. He could independently write in sentence form using correct upper and lower case letters (see Figure 1 for an example). His ability to confidently form lowercase letters at the start of year 1 was surprising as his mother had only focused on upper case letters in environmental print. In most situations, Harry no longer needed to sign shapes in the air or say their directions aloud. Harry had internalized the ability to write letters and words. However, Harry could occasionally be heard whispering the directions of some letters when he wrote independently at home. Winsler and Naglieri (2003) described this progression from external speech via whispering and silent lip movements to fully internal or private speech as a characteristic developmental pattern observable as children complete challenging tasks.

### **Print motivation**

Observations indicated that Harry's print motivation during the parent-child interactions with environmental print and joint writing activities was high. He responded enthusiastically during the interactions and used the active multisensory approach to investigate the environmental print he discovered. He also linked the multisensory approach to his drawing and writing, which motivated him to explore reading and writing further. He did not get frustrated when he wanted to write something new because he knew his mother could scaffold his letter formation and spelling using the directional terms up, down, around, and across. Several learning experiences were observed during Harry's development to suggest that his enthusiasm and self-motivation to write may be at least partly attributable to the approach used. For example, the writing sample shown in Figure 2 was collected when Harry was engaged in a child-initiated writing activity (Figure 2).

Harry was drawing when he spontaneously began to copy the environmental print brand name label (TEXTA) of the pens that he was using. The sample also indicates that Harry was intrinsically motivated to self-correct his letter shapes as he said aloud the directions of the letter shapes as he drew them. As shown in Figure 2, he persisted with the use of the directional language to guide his letter formation until he got the X at a more correct orientation.

The image shows four rows of handwritten text. The first row is 'T E T', where the 'E' is a simple horizontal bar and the 'T' is a vertical bar with a horizontal top bar. The second row is 'T E T', where the 'E' is a simple horizontal bar and the 'T' is a vertical bar with a horizontal top bar. The third row is 'T E X', where the 'E' is a simple horizontal bar and the 'X' is a vertical bar with a horizontal top bar. The fourth row is 'T E X T A', where the 'E' is a simple horizontal bar, the 'X' is a vertical bar with a horizontal top bar, and the 'A' is a vertical bar with a horizontal top bar.

*Figure 2.* During an independent, child-initiated writing exercise at 5½ years, Harry spontaneously copied environmental print and used self-correcting skills whilst supporting his own writing by saying to himself the letter directions.

### **Discussion**

The important role that parents can play in scaffolding their child's emergent literacy learning has been well documented (e.g., Otto, 2008). The present study focused on describing strategies used by one parent during interactions that made use of environmental print and joint writing activities. Environmental print was shown to be an extremely useful



tool to utilize. The child's guided exposure to environmental print from 2 years of age helped him to develop the visual skills needed to orient towards print (Clay, 1975) and acquire alphabet knowledge. It proved to be an abundant stimulus the parent could use to motivate the child from 2 years of age to become aware of letters. Environmental print is non-costly, highly accessible, and available for use by parents from a range of socioeconomic and cultural backgrounds.

The use of environmental print in combination with a multisensory strategy of physically forming letter shapes proved to be enjoyable for the child. As the child developed, he was motivated to explore print in various formats and used this print knowledge as a foundation to explore letters and words further (e.g., tracing environmental print with his finger and transferring this knowledge to drawing letter shapes on paper then writing through the scaffolding technique using directional language). The scaffolded guidance in letter and word formation that the parent provided (using the *up down* idiographic language) meant that the child did not become frustrated when writing new words. These tools were also found to enhance the child's kinesthetic memory of the letter shapes and his learning of letter names and sounds (e.g., "B for Baby goes down, around and around"). In accordance with Vygotskian (1978) principles of continual movement in the zone of proximal development, the scaffolding tools of materialization (physically forming the directions of letter shapes through tracing and forming letter shapes in the air) and private speech (saying aloud the directions of letters - up, down, around and across) were no longer used when the skills of writing a particular letter shape had moved into the child's level of independent mastery.

It is likely that the approach described in this case study is reliant on a quality relationship between parent and child. Dodici, Draper, and Peterson (2003) found that the quality of parent-child interactions (e.g., the degree of sensitivity, responsivity, guidance and attention) at 2 years predicted literacy outcomes in the children at 4½ years. Secure attachments, which are characterised by sensitivity and responsiveness, are associated with a greater frequency of shared reading activities such as pointing, labelling, and commenting (Bus, Belsky, van IJzendoorn & Crnic, 1997). The approach outlined in this paper also requires a certain degree of sensitivity, responsivity, guidance, and attention. For example, the parent must be alert to the child's attention to environmental print and capitalise on these spontaneous encounters in order to instigate a learning opportunity. However, beyond that, the spontaneous nature of the triggers for the literacy interactions mean that they can occur in the midst of everyday activities (such as mealtimes, shopping, travelling in the car) and so do not present an onerous time burden on even the busiest of parents. This approach is also suitable for use by parents with low literacy skills themselves, as most adults can identify common environmental print logos and individual letters, which are the essential requirements for the literacy interactions. Parents who themselves are poor readers may not engage in storybook reading or other common early childhood literacy activities due to their own lack of confidence. This approach provides a non-threatening, enjoyable avenue for them to explore print with their child.

In summary, the preliminary evidence obtained suggests that the scaffolding approach, incorporating environmental print and a multisensory approach, is a promising approach for supporting early literacy skills, particularly emergent writing skills, alphabet knowledge, and print motivation. It may also have great potential as an early

intervention/enrichment literacy program for young children at risk of developing reading and writing difficulties. The multisensory approach used in the present study could be applied in direct instruction methods. The whole body movements, directional signing using the terms “up”, “down”, “around”, and “across”, forming letter shapes in the air, and tracing of letters links physical activity to writing. These methods also increase motivation and engagement and could thus facilitate learning in preschool educational environments. However, further evidence is needed to clarify the cause of the outcomes observed in this case study and to determine what more generalisable or long-term benefits they might have for literacy development in children. A controlled, randomized trial of this approach, with standardized quantitative measures is needed to ascertain the benefits of the approach for scaffolding young children’s emergent writing and literacy skills. Future research could examine the approach as used by the parent in a home environment and by a teacher in a toddler-preschool educational context.

## References

- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge: MIT Press.
- Aram, D., & Levin, I. (2002). Mother-child joint writing and story book reading: Relations with literacy among low SES kindergarteners. *Merrill-Palmer Quarterly*, 48, 202-224.
- Aram, D., & Biron, S. (2004). Joint storybook reading and joint writing interventions among low SES preschoolers: Differential contributions to early literacy. *Early Childhood Research Quarterly*, 19, 588-610.
- Baghban, M. (2007). Scribbles, labels, and stories: The role of drawing in the development of writing. *Young Children*, 62, 20-26.
- Biehler, R. F., & Snowman, J. (1997). *Psychology applied to teaching* (8<sup>th</sup> ed.). Boston: Houghton Mifflin Co.
- Birsh, J. R. (2005). *Multisensory teaching of basic language skills* (2<sup>nd</sup> ed.). Baltimore: Paul H. Brookes.
- Bodrova, E., & D. J. Leong. (1998). Scaffolding emergent writing in the Zone of Proximal Development. *Literacy Teaching and Learning*, 3, 1-18.
- Bus, A. G., Belsky, J., van IJzendoorn, M. H., & Crnic, K. (1997). Attachment and book reading patterns: A study of mothers, fathers and their toddlers. *Early Childhood Research Quarterly*, 12, 81-98.

- Clay, M. M. (1975). *What did I write? Beginning writing behaviour*. Auckland: Heinemann.
- Dodici, B. J., Draper, D. C., & Peterson, C. A. (2003). Early parent-child interactions and early literacy development. *Topics in Early Childhood Special Education, 23*, 124-136.
- Ehri, L. C., & Roberts, T. (2006). The roots of learning to read and write: Acquisition of letters and phonemic awareness. In D. K. Dickinson & S. B. Neuman (Eds.), *Handbook of early literacy research vol 2* (pp. 113-131). New York: Guilford Press.
- Elliot, E. M., & Olliff, C. B. (2008). Developmentally appropriate emergent literacy activities for young children: adapting the early literacy and learning model. *Early Childhood Education Journal, 35*, 551-556.
- Hollingshead, A. B. (1975). *The four-factor index of social status*. Unpublished manuscript. Yale University, New Haven, CT.
- Hood, M., Conlon, E., & Andrews, G. (2008). Preschool home literacy practices and children's literacy development: A longitudinal analysis. *Journal of Educational Psychology, 100*, 252-271.
- Kuby, P., Goodstadt-Killoran, I., Aldridge, J., & Kirkland, L. (1999). A review of research on environmental print. *Journal of Instructional Psychology, 26*, 173-182.
- Mayer, K. (2007). Emerging knowledge about emerging writing. *Young Children, 62*, 34-40.

- Moats, L. C & Farrell, M. L. (2005). Multisensory structured language education. In J. R. Birsh (Ed.), *Multisensory teaching of basic language skills* (2<sup>nd</sup> ed.) (pp. 23-41). Baltimore: Paul H. Brookes.
- Otto, B. (2008). *Literacy development in early childhood: Reflective teaching for birth to age eight*. New Jersey: Pearson Education.
- Neumann, M. M. (2007). *Up Downs: a fun and practical way to introduce reading and writing to young children aged 2-5*. Sydney: Finch.
- Ritchey, K. D. (2008). The building blocks of writing: Learning to write letters and spell words. *Reading and Writing, 21*, 27-47.
- Saracho, O. N. (1997). Using the home environment to support emergent literacy. *Early Child Development and Care, 127-128*, 201-216.
- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.
- Winsler, A., & Naglieri, J. (2003). Overt and covert verbal problem-solving strategies: Developmental trends in use, awareness, and relations with task performance in children aged 5 to 17. *Child Development, 74*, 659 – 678.
- Wood, C. (2002). Parent-child activities can affect the development of literacy skills. *Journal of Research in Reading, 25*, 241-258.
- Wood, D., Bruner, J. C., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89-100.

## Chapter 4 Prelude

### **Parental Strategies to Scaffold Emergent Writing Skills in the Preschool Child within the Home Environment (Study 2)**

Study 2 extends the work presented in Study 1 to examine the effects of maternal use of environmental print to scaffold emergent writing. To date, little is known about the role environmental print plays in emergent writing development. Case Study 2, which has been published in *Early Years: An International Journal of Research and Development*, describes environmental print strategies a mother used to scaffold her daughter's letter name, shape, and sound knowledge, and emergent writing described within the framework of Gentry's (2005) writing stages (non-alphabetic, pre-alphabetic, partial alphabetic, full alphabetic, and consolidated). Multisensory activities were used and involved pointing out environmental print and tracing letters with fingers on grocery, clothing and toy labels, forming letter shapes in the air and using directional language (up, down, around, and across) to scaffold "Roseanna's" letter shaping. Letter names were used to assist in word spelling and writing. Evidence of Roseanna's own intrinsic motivation to engage in literacy activities through her copying of personally meaningful environmental print labels (e.g., 'My Little Pony') is provided. Parental use of directional language also reduced the child's frustration when she had forgotten or did not know how to shape a letter during joint writing activities. The importance of maternal sensitivity and child-directed activities with guidance during joint writing are emphasised. Chapter 4 provides evidence of the ways in which maternal use of environmental print in the home setting can support emergent writing development.

**Statement of contribution to Chapter 4 co-authored published paper**

**Neumann, M. M., & Neumann, D. L. (2010). Parental strategies to scaffold emergent writing skills in the preschool child within the home environment. *Early Years: An International Journal of Research and Development*, 30, 79-94.**

This chapter includes a co-authored paper. The bibliographic details of the co-authored paper, including all authors, are: Michelle. M. Neumann and Associate Professor David Neumann.

My contribution to the paper involved the literature review, data collection, data analyses, and writing of the review paper. The co-author provided review of drafts.

Name of Student: Michelle Neumann

(Signed)

Corresponding authors of published paper:

Name of Corresponding Author:

(Countersigned) Associate Professor David Neumann

(Countersigned)

Supervisor: Name of Supervisor: Dr Michelle Hood



## **Chapter 4**

### **Parental Strategies to Scaffold Emergent Writing Skills in the Preschool**

#### **Child within the Home Environment**

Michelle M. Neumann & David L. Neumann

*School of Psychology, Griffith University, Gold Coast, Australia*

### **Abstract**

Joint writing activities between parent and child can enhance literacy skills in young children. This paper describes the strategies used by a mother to scaffold her daughter's alphabet letter shaping, word, and story writing in the years before formal schooling. The strategies included identifying alphabet letters embedded in environmental print and books, tracing letter shapes with fingers whilst using directional language, and using whole arm movements to form letter shapes in the air. Writing samples and examples of parent-child interactions were collected at 3 to 4 years of age and are described within the framework of Gentry's writing stages. The joint-writing techniques and activities illustrated in this case-study emphasize the use of letter names and letter shapes and may provide effective strategies for parents and early childhood educators to scaffold emergent writing development in young children.

*Key words:* emergent writing, joint-writing activities, alphabet knowledge, parent-child interaction, scaffolding strategies, environmental print

## Introduction

Emergent writing skills include a positive attitude towards writing and print, an understanding of the concepts and functions of writing, representation of ideas through scribbles, drawings and rudimentary letter formations, copying print from the environment, and linking of letters to sounds when experimenting with writing (Chan, Zi Juan, and Lai Foon 2008; Mayer 2007; Otto 2008). From an emergent literacy perspective, learning to write begins very early in a child's life (Stellakis and Kondyli 2004) and the home environment can provide many opportunities to develop emergent writing skills (Aram and Levin 2002; Neumann, Hood, and Neumann 2009). However, especially when compared to parental story book reading relatively little research has examined parental involvement in emergent writing (Aram 2008). This may reflect the spontaneous and functional nature of home writing activities (e.g. labelling one's clothing, making a birthday card; Burns and Casbergue 1992), which do not occur as systematically or frequently as storybook reading (Wood 2002). Nevertheless, the critical role parents play in supporting their children's early writing, providing writing materials, mediating and clarifying writing interactions has been established (Aram 2002; Aram and Levin 2001 2002; Burns and Casbergue 1992; Neumann and Neumann 2009; Otto 2008; Stellakis and Kondyli 2004; Yang and Noel 2006).

As early as 2 to 3 years of age, children begin to understand the symbolic nature of print (e.g. differentiating print from pictures/drawings; Lavine 1977; Yamagata 2007) and experiment with representing rudimentary features of written language in the forms of horizontal lines, arcs, circles, and dots (Stellakis and Kondyli 2004). Educators have used scaffolding techniques to support emergent writing in children. Scaffolding refers to the

interactional guidance provided to a child within their Zone of Proximal Development which is the space between a child's level of mastery with and without assistance (Vygotsky 1978). Scaffolding also describes the process by which a learner moves from assisted to independent performance (Bodrova and Leong 1998).

Scaffolding can use visual or verbal cues to help a child develop writing skills. Bodrova and Leong (1998), for example, used visually highlighted lines as a scaffolding tool to help kindergarteners represent their units of oral speech in written form. Eventually, this scaffolding tool was no longer needed when the children were able to plan and monitor their own writing process. Gentry (2005) also described the benefits of stretching out the sounds in words to verbally scaffold a kindergarten child's early word writing. In addition, letter formation was scaffolded by using verbal descriptions of letter shapes to help the child remember how to form it (e.g. the lower case *n* was described by the kindergarten teacher as a stick with a hump. The verbal description was no longer needed when the child could independently write the letter.

Stellakis and Kondyli (2004) suggest that learning to write is facilitated through real, daily, meaningful, and interactive print rich experiences and activities. In this context, parents can play an important role in scaffolding their child's emergent writing skill acquisition (Aram 2002; Aram and Levin 2002; Burns and Casbergue 1992; Yang and Noel 2006). For example, Aram and Levin (2002) examined mothers' scaffolding strategies (e.g. word segmenting, retrieval of letter shapes and printing) during joint writing activities with their kindergarten children. Mediation in joint writing activities was strongly linked to basic literacy skills such as word writing/recognition and phonological awareness.

Other researchers have examined the strategies used by parents to support their preschool children's emergent writing development (e.g. Aram and Levin 2001; Aram 2002; Bissex 1980; Burns and Casbergue 1992). The guided writing strategies have included the parent holding and leading the child's hand to write the letters and words (Aram and Levin 2001 2002; Aram 2002), the parent writing a letter or word and encouraging the child to copy it (Aram and Levin 2001, 2002; Aram 2002), and the parent dictating the names and sounds of letters for the child to write their word (Aram and Levin 2001, 2002; Burns and Casbergue 1992). Aram and Levin (2001) also reported how a mother verbally scaffolded her child's formation of an unknown letter by saying a word that included this letter or by explaining how to change a known letter to make the unknown one (e.g. this could be done by changing an L to make E).

The present research reports on the interactions and scaffolded writing strategies that one parent used with her preschool aged child over a 2 year period before her child began formal schooling. The young age of the child required the parent to use strategies that emphasised the use of letter names and letter formation as a way to help the child identify and write letters. The parent-child interactions are described within the framework of Gentry's (2005) early writing stages. Gentry's (2005) writing scale begins with *non-alphabetic* writing consisting of non-discernable marks and scribbles. Stage 1 is *pre-alphabetic* writing where children show some control of letter formation (pre-communicative spelling) consisting of random letter strings with no letter-sound correspondences. Stage 2 is *partial alphabetic* writing and involves writing a few letter sound matches mixed with random letters (semi-phonetic spelling). Stage 3 is labelled *full alphabetic* writing where children use a letter for each sound (phonetic spelling). Stage 4

consists of *consolidated alphabetic* writing where about two-thirds of words are spelled correctly (transitional spelling). The description of parent-child interactions during this case study spans from the non-alphabetic stage through the pre-alphabetic and into the partial alphabetic phase of writing.

### **Description of the child**

Roseanna was from a middle income Australian family. Her mother and father were teachers. She had two older sisters (5 and 6 years older), one older brother (2 years older), and one younger brother (2 years younger). Her cognitive and physical development were normal. During her preschool years at home, before beginning full-time preparatory school at 5 years of age, Roseanna did not experience any letter drills, phonics instruction, or formal reading or writing instruction.

### **Data collection**

To examine the parental strategies and interactions during joint writing activities, a longitudinal case study approach was used. Parent-child interactions were recorded in note form by the parent when the child was between the ages of 3 years 1 month to 4 years 11 months. This age range was used because it spanned the child's development across Gentry's (2005) non-alphabetic writing, pre-alphabetic, and partial alphabetic stages. It also spanned the age before the child began formal preparatory schooling. The notes made by the parent recorded information about the type of task the parent and child were engaged in, the objects that were being used, what behaviours occurred, and the dialogue that occurred during the interaction. A total of 40 writing samples were also collected. Due to the spontaneous nature of the joint-writing activities in the home environment it was not

possible to record every interaction. From the data, vignettes and writing samples were selected that were indicative of the general nature of the interactions that occurred during the entire duration of the study. The majority of the parent-child interactions were with the mother. Some writing samples also contained the child's drawings. Children drawing when they write has been noted to occur naturally during young children's early writing development (e.g. Baghban 2007; Clay 1975; Temple, Nathan, and Burris 1982). However, it is the child's written products and parent-child interactions that will be focussed upon in this report.

## **Observations and writing samples**

### *Non-alphabetic writing stage*

Roseanna's non-alphabetic writing stage occurred between 3:1 and 4:0 years. Examples of parent-child interactions and joint-writing activities included: making letter shapes out of play-dough, tracing environmental print with fingers, forming letter shapes in the air, singing songs with whole body and arm and hand movements, and learning of directional language up, down, around, and across. These activities share the common elements that they made use of gross (whole body and arm) and fine (finger) motor skills, directional language (up, down, around and across), and introduced simple letter shapes (e.g. M, O) (Neumann 2007).

Environmental print (e.g. labels on food products, clothing, toys) was used extensively to scaffold emergent writing activities. The parent pointed out environmental print and print on story book titles on a daily basis. Roseanna quickly became aware of print in the environment and began pointing it out herself. This environmental print was

mostly in upper case form and for this reason the parent emphasized upper case letters during the interactions. Research has also shown that knowledge of upper case letters develops earlier than lower case letters in young children (Worden and Boettcher 1990). This suggests that upper case letters should be used frequently during instruction (Bowman and Treiman 2004).

During the interactions, the parent always said the letter name that accompanied the printed text. There were also some instances in which the parent incorporated letter sounds during the interaction. In most cases, this occurred when the interaction incorporated alphabet books, story books, or singing songs (e.g. “snake slides in the sun s,s,s,s snake slides having fun”) but it also occurred during some interactions with environmental print. The parent-child interactions may thus be said to have emphasized letter names over letter sounds.

In addition, the parent took the opportunity to occasionally point out both letter names and sounds when appropriate and where possible, the environmental print letter the child was focussed on. There was occasionally an intermix of both with the parent using previous letter names and sounds discussed before to prompt Roseanna in remembering a feature of the letter in a new context or word. The parent would also refer to letters associated with familiar objects Roseanna had previously read about in her alphabet story book (e.g. “A is for apple. The A is in the word OATS –see!”).

Below is an example of a parent-child interaction with environmental print.

[At breakfast Roseanna pulls out a cereal box from the pantry and her Mum points out the print on the box.]



Mum: Look Roseanna! There's an O for Oats it goes around and around like the wheels of a car. Let's trace it with our finger.

[Roseanna traces the O on the box then forms it in the air].

Roseanna and her Mum begin to sing their car song that goes 'round and round and round and round and round goes the wheels of a car' whilst moving their arms around in a circle.

Roseanna: Points out the next letter and begins to trace it with her finger.

Mum: Yes! It's an A for apple and goes 'up, down, and across'. And look the next letter is a T for toy, it goes down and across.

Roseanna: There's a snakey 'SSSS'! [Roseanna makes the snake sound]

Mum: Great work! [Mum points to the word on the box again whilst running her finger under the word]. That word says OATS! We are having oats for breakfast.

Later that day, Roseanna pointed out and traced the letter T with her finger on a 'Thomas the Train' toy label.

Mum: That's a T for 'THOMAS' can you find an M for Mum? [Mum points to it].

Roseanna: [She points to the M]

Mum: Yes! M for Mum goes up, down, up, down. [They trace the M on the label with their finger then form the M shape in the air].

Roseanna transferred her knowledge of letter shapes to different contexts as she independently pointed out the same letter shape embedded within a variety of environmental print words (e.g. she pointed out M: in **McDonalds**, in the toy label **THOMAS** and in the chocolate drink label **MILO**).

The parent also helped Roseanna form letter shapes with cookie dough and play dough and traced over the letter shapes with their fingers using directional language (up, down, around, across). The use of play dough to form letters transferred to other objects in the home. The parent observed Roseanna forming her own letter shapes out of household materials such as wool, string, and food (e.g. an F out of fish fingers, an O for Octopus from a hair ribbon, making an S for snake out of spaghetti, and using twigs in the garden to make a T).

The parent provided Roseanna with a range of writing tools (e.g. crayons, paints, pencils) and she enjoyed playing with them whilst exploring and experimenting with mark making on a variety of materials (e.g. paper, cardboard, blackboard). Roseanna was encouraged to form patterns and shapes on paper that went ‘up, down, up, down’ as the mother modelled and drew shapes on a vertical chalk board using the up and down language. Round shapes were introduced by drawing the wheels of a car and singing ‘round and round goes the wheels of a car’. The term ‘across’ was introduced by the parent modelling and encouraging Roseanna to draw a round sun with lines that go ‘across, across and across’ as the example shows in Figure 1. These joint drawing activities helped Roseanna make the link between the physical hand movement and shape and pattern formations that go ‘up, down, around and across’.



Figure 1. Through parent scaffolding, Roseanna learnt to draw lines that go ‘across’, as in the letter ‘A’, by drawing lines for the rays of the sun.

After Roseanna had mastered basic shapes and patterns, the parent helped her experiment with writing a few simple letter-like shapes such as an ‘M’ for mum that went up, down, up, down then stop! ‘A’ for apple that went up, down and across and ‘O’ for

octopus that went around. Figure 2 shows examples of the marks that were produced during this interaction. The letter-like shapes that were produced during this interaction might be taken as evidence that Roseanna had entered the pre-alphabetic stage. However, the child was not considered to have entered this stage because they were produced only through the parent's use of directional language to guide the child's patterns and shapes. There was no evidence that the child could write letter-like shapes when unassisted by the parent. Rather, the directional language used by the parent may be interpreted as the parent scaffolding the child's writing development within their zone of proximal development.



Figure 2. Roseanna's scribbles and letter formation when the mother scaffolded the writing of basic patterns and shapes and basic letters of e.g. 'O', 'A', and 'M'.

There were instances in which the parent and child did not have writing materials with them such as driving in the car. In these interactions, the parent made use of alphabet

letters embedded within environmental print signs. The parent would encourage the child to form the letters in the air using the directional language up, down around and across (e.g. Roseanna: ‘There’s an “M” in McDonalds. Parent: ‘And it’s also an “M” for Mouse. Let’s make an M in the air with our hand. M goes up, down, up, down’).

### ***Pre-alphabetic writing stage***

At 4 years 1 month, Roseanna showed evidence of entering the pre-alphabetic stage by forming discernable letter shapes independently. For example, Roseanna began writing the first 3 letters of her name unassisted in uppercase letters. However, she requested parental assistance with the remaining letters. To assist her, the mother used directional language (up, down, around, and across) to verbally scaffold (e.g. “the next letter E goes down, across, across, and across) formation of the final letters in her name. When writing the names of familiar objects such as Apple or Cat, Roseanna just wrote an A or strings of random letters with no letter-sound associations. However, she accurately and independently copied simple words such as MUM and COW and story book titles, but could not reread her writing. When asked if she could write her own story, Roseanna spontaneously drew a continuous up and down pattern to represent her story (see Figure 3). The zigzag-like pattern that was shown may represent Roseanna’s understanding that a story represents continuous speech.



Figure 3. The spontaneous up and down pattern produced by Roseanna when she was asked to write a story in the pre-alphabetic phase.

Many of the words in her birthday card greetings for friends and family and shopping lists were child-initiated writing activities with the letter shapes and spelling scaffolded by her mother. Sometimes Roseanna wished to write a favourite word or label for one of her drawings. For example, after watching the movie ‘Scooby Doo’, she drew a picture of Scooby Doo and wanted to write his name (see Figure 4). Through parent scaffolding she was able to do it immediately, as follows:

Roseanna: How do I write Scooby Doo?

Parent: What letter do you think comes first?

Roseanna: [She says the word to herself emphasising the first letter] ‘SSSSScooby’.

Parent: That’s right, an S. Move your pencil in a snakey shape.

Roseanna then formed the S correctly and the parent continued to orally scaffold each letter shape in the name as Roseanna wrote them.



Figure 4. Parent Scaffolding of 'Scooby Doo', a label for Roseanna's drawing.

Environmental print surrounded Roseanna everyday and her awareness of it was evident in the independent writing samples that were collected. Roseanna showed her intrinsic motivation to spontaneously copy words in her home environment. Samples of unassisted copying of favourite environmental print labels included a juice bottle label (e.g. POP TOPS), movie titles from CD-ROM and DVD cases (e.g. MR HAPPY, ET), and toy labels (e.g., My Little Pony). These unassisted writing samples with no parent scaffolding of the letter shapes are shown in Figure 5.



Figure 5. Unassisted copying of environmental print from various items. The left panel shows the items of environmental print and the right panel shows the child's writing. The copied print were 'Pop Tops' from a drink product label (top), 'Mr Happy' from a CD-ROM case (middle), and 'My Little Pony' from a toy label (bottom).

Figures 4 and 5 also show examples of the child making a drawing to accompany her writing. Temple, Nathan, and Burris (1982) note that drawings may be related to a child's writing in two main ways. First, the drawing may be unconnected to the text and does not help the reader's understanding. The top panel of Figure 5 in which POP TOPS is written represents an instance of this. The "people" that accompany the writing were not present on the product packaging. The second use of drawing is when the picture is

intricately related to the text. The remaining drawings in Figure 5 are instances of a close relationship with the text. The “people” that accompanied the MR HAPPY text represent the Mr. Men characters and these characters were also on the CD-ROM case from which the child copied. The “pony” that was drawn with the MY LITTLE PONY text also represents a character that was present on the toy label that the child copied from.

### ***Roseanna’s partial alphabetic writing stage***

Roseanna showed movement into the partial alphabetic phase by 4 years 11 months through evidence of independent word writing with invented spellings and some phonetic representations. For example, Roseanna used some letter-sound correspondence knowledge to spell and read simple words by sounding out the letters, such as ‘CAT’ and ‘DAD’.

However, during her early invented spelling attempts she wrote for example, ‘MP’ for ‘MUM’ and ‘SFM’ for ‘SAM’ indicating that she had entered the partial alphabetic stage and her letter-sound knowledge of initial and final letters in words was developing.

Roseanna was able to form all the letters in her first name without assistance and recognise her name in different contexts (e.g. on a birthday invitation, Christmas present label etc.).

However, she was unable at this stage to write her surname without assistance. During these instances the mother guided the writing of Roseanna’s surname by using directional language (up, down, around, and across e.g. U goes down, around, and up) to verbally scaffold the formation of the letter shapes and the spelling of her surname. This approach boosted Roseanna’s confidence and motivation to write new words with her mother’s assistance.



The parent-child activities during this stage included name writing, making birthday cards, shopping lists, labelling drawings, copying environmental print, and story writing. During these activities the need for parent scaffolding of letter shapes decreased as the child's knowledge about letter names and shapes increased. Roseanna continued to develop her ability and confidence in accurately copying product labels in the home environment (e.g. HOME BRAND, NUTRI GRAIN, MILK) and book titles (e.g. INSECTS AND SPIDERS) without assistance. In one instance, Roseanna was seen copying the label 'Baby Wipes'. This label was printed in upper and lower case letters. It was interesting to note that Roseanna copied the lower case 'b' in 'Baby' and correctly orally identified the lower case 'e' in 'Wipes' but chose to write it as an upper case E. This suggests that although Roseanna had been introduced mainly to upper case letters by her parents, her knowledge of lower case letters was also developing through her exploration of print in alphabet books, story books and a variety of environmental print labelled products. Figure 6 shows samples of Roseanna's unassisted copying of environmental print, including that of 'Baby Wipes'.



Figure 6. Unassisted copying of environmental print from commercial product labels. The left panel shows the items of environmental print and the right panels shows the child's writing. The copied print were 'Nutrigrain' (top) and 'Baby Wipes' (bottom).

On other occasions, Roseanna spontaneously and orally dictated a story to her mother and asked her to help write it down. For example, one of Roseanna's stories was: *'One day there was a boy and a girl playing in a park. The boy tripped over and hurt his leg and then Mummy saw him and put a band-aid on him'*. The mother spelt out each word and dictated each letter. Roseanna knew many letters already and wrote them down as her mother said the letter names (see Figure 7). However, sometimes Roseanna had forgotten how to shape a particular letter (e.g., E) or did not know how to form an unfamiliar letter (e.g., Y, G, P and R) so her mother orally scaffolded Roseanna's letter shaping using directional language (up, down, around, and across). For example, in the word DAY within her story, Roseanna had forgotten how to write the letter Y. The mother explained 'Y is for Yo-Yo it goes down, up and down, let's form it in the air together. Roseanna formed the letter in the air with her hand then wrote the letter Y on her page. Roseanna confused a B with a P, leading the parent to say it's 'P for PLAY, remember P is for Pig 'puh, puh, puh', it goes down and around. But B is for Boat and B is for Boy in your story. 'B goes down, around and around'. This verbal scaffolding allowed Roseanna to write the correct letter shape.

Roseanna was also encouraged to make a finger space in between each word, but this was difficult for her to remember and manage as seen in Figure 7. When Roseanna had finished writing one page she drew a picture, then the parent and child read the story together. However, it was difficult for Roseanna to point to and differentiate one word from another as the spaces between the words were narrow or absent. Other researchers have also noted that children have difficulty in rereading their writing if they omit spaces between words or put spaces within words (Clay 1975; Kamberelis and Perry 1994).

ONE DAY THERE  
 WAS A BOY AND  
 A GIRL PLAYING  
 IN PARK. THE  
 BOY TRIPPED  
 OVER.

Figure 7. Roseanna's story produced by the parent scaffolding in which each letter was spelt out and directional language used to help form unfamiliar letters.

The mother scaffolded Roseanna's writing further by using lines. Initially, individual lines were used to indicate each letter within a word (e.g. \_ \_ \_ \_ \_). As shown in Figure 8, this guided not only the placement of each letter within a word but also the spaces between words. With the visual guidance of these lines, Roseanna did not need to use finger spacing when writing and was able to focus more on thinking about matching sounds to letters and forming each letter shape. On completion of writing her story, Roseanna enthusiastically read her story back to her parent pointing to each individual word as the words were now visually clearer to differentiate from each other. This technique was much more effective than using fingers to make spaces between words. When Roseanna showed that she no longer needed to have the scaffolded individual lines to guide the placement of each letter within a word, her parent used one long line (e.g. \_\_\_\_\_) to represent all the letters within a word. As shown in Figure 8, in most instances a short line was used for short words and a longer line was used for long words. Using lines to represent whole

words that a child intends to write is an effective scaffolding technique devised by Bodrova and Leong (1998). This technique was also useful in scaffolding spacing between each word and helping Roseanna remember the next word she had intended to write.

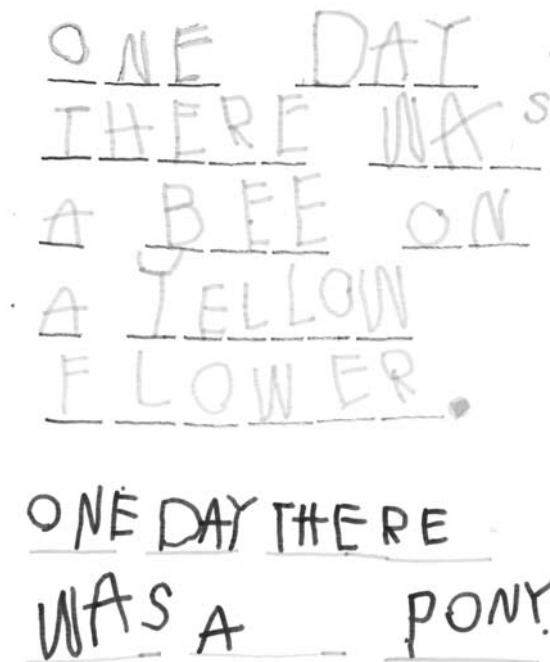


Figure 8. Techniques used to scaffold Roseanna's story writing used lines to indicate each letter (top) and lines to indicate whole words (bottom).

With parental scaffolding of her letter and word formation and numerous rich joint writing experiences, Roseanna had become a motivated and competent emergent writer in the early partial alphabetic phase. Furthermore, although Roseanna possessed only limited letter-sound knowledge at this stage, she had mastered most of her alphabet letter names, possessing the fine motor skills to form letter shapes and had begun linking letter names to shapes and sounds. It is possible that these essential emergent literacy skills may assist her

movement from the partial alphabetic to the full alphabetic stage during her first years of formal literacy learning at school.

***Summary of the scaffolded emergent writing strategy***

The main writing strategies used by the parent are summarized as follows:

- (a) Introduced and pointed out print in the child's environment (e.g. food/clothing/toy product labels, storybook titles).
- (b) Used songs and nursery rhymes that incorporated directional actions and arm movements (e.g. Incy Wincy Spider climbed *up* the water spout, *down* came the rain)
- (c) Traced letters in the environment with fingers using directional language (up, down, around, and across), named letters and made their sounds, formed letter shapes in the air, and made letter shapes with household materials (e.g. string, cookie dough).
- (d) Associated each letter name with a familiar word and directions used when writing it (e.g. 'M for mummy' goes up, down, up, down)
- (e) Used directional language to verbally scaffold the child's writing of letter shapes (e.g. E is for Egg it goes down, across, across, and across).
- (f) Guided the child's letter shaping and spelling (e.g. 'FLOWER starts with an F for Fish it goes down, across and across, then L for Lion it goes down and across' and so on).
- (g) Scaffolded word writing by using individual lines to represent each letter and scaffolded sentence writing by using individual lines to represent each word (Bodrova and Leong 1998).

## Discussion

It has been well established that parents play an important role in supporting their child's emergent writing development (Aram and Levin 2001 2002; Aram 2002). The parent-child joint writing interactions and simple strategies reported in this study detailed many practical ways in which parents can scaffold their child's emergent writing skills. The strategies used by the parent provided many rich opportunities for Roseanna to communicate and interact with her parent in a meaningful way about print and represent letter shapes in a variety of ways (e.g. forming letter shapes in the air or making letter shapes out of house-hold materials). The directional language (up, down, around, and across) used by the parent also scaffolded Roseanna's letter shaping during their joint writing activities such as writing a shopping list, labelling a drawing or during story writing activities. In addition, Roseanna did not become frustrated when she did not know how to form the next letter shape in her word because she knew that her mother could scaffold the shape using directional language (e.g. F for fish goes down, across and across). Finally, Roseanna evidenced her intrinsic motivation to experiment with writing and explore print further in a range of contexts and genres through initiating her own writing activities and copying environmental print.

It is essential that joint writing activities in the preschool years are child-directed but parent guided so the child remains interested and supported during each activity (Aram 2002; Chan et al. 2008). The strategies described in this study may be better suited to literacy interactions between child and parent than between child and early childhood educators. Parents may be more aware of what interests and motivates their child and can structure literacy interactions accordingly. It is also likely that the quality of the relationship

(e.g. degree of sensitivity, responsiveness, guidance, and attention) between the parent and child may influence the quality and frequency of parent-child literacy interactions (Dodici, Draper, and Peterson 2003). If the strategies described in this study are to be adopted by early childhood educators, it is crucial that they use developmentally appropriate drawing and writing activities that are adapted to the individual child's needs and abilities to foster each child's interest, engagement, and motivation to explore print further (Elliot and Ollif 2008). Baghban (2007) also suggests that early educators use flexible and open-ended opportunities to write and draw in and avoid stating that there is a "correct way" of doing either.

The need to motivate young children's interest and awareness of print is particularly important in preschool age children who are at risk of developing future reading and writing difficulties, such as children who are language impaired (Justice et al. 2003). For example, a recent study by Cabell et al. (2009) has shown that children with language impairment lag significantly behind their typical language peers in emergent writing abilities. They also describe how language impaired children may be more likely to actively resist participating in shared writing and reading activities. Cabell et al. (2009) stress the importance of giving parents of language impaired children emergent literacy strategies that motivate their children to be intrinsically interested in exploring print and participating in joint writing activities.

The types of joint writing activities described in this case study coupled with the scaffolded letter shaping strategy based on the use of tracing environmental print with fingers, whole body movements and forming letter shapes in the air, use of directional language (up, down, around, and across) and using lines to represent letters and words, may

provide useful tools for parents to scaffold their child's alphabet letter shaping, emergent writing, alphabet knowledge, letter-sound knowledge and print motivation. As many parents may find an emphasis on using letter-sounds unfamiliar, early literacy strategies that emphasise letter names and shapes may be more appealing to them. Further research could examine the effectiveness of these strategies by comparing them with other naturally-occurring parental strategies (e.g. the parent writing a letter or word and encouraging the child to copy it; Aram and Levin 2001 2002). Future research could also examine the use of these joint-writing strategies in a preschool educational setting.

#### **Notes**

This article includes a word or words, logos, or brands, that is, or is asserted to be, a propriety term or trademark. All trademarks remain property of their respective holders, and are used only to directly describe the products. Inclusion does not imply it has acquired for legal purposes a non-propriety or general significance, nor is any other judgement implied concerning its legal status.



### References

- Aram, D. 2002. Joint writing in Hebrew of dictated words versus proper names: Analysis of low SES mother-kindergartner dyads. *Journal of Research in Childhood Education* 17: 47-61.
- Aram, D. 2008. Parent-child interaction and early literacy development. *Early Education and Development* 19: 1-6.
- Aram, D., and I. Levin. 2001. Mother-child joint writing in low SES sociocultural factors, maternal mediation, and emergent literacy. *Cognitive Development* 16: 831-52.
- Aram, D., and I. Levin. 2002. Mother-child joint writing and story book reading: Relations with literacy among low SES kindergarteners. *Merrill-Palmer Quarterly* 48: 202-24.
- Baghban, M. 2007. Scribbles, labels, and stories: The role of drawing in the development of writing. *Young Children* 62: 20–26.
- Bissex, G. L. 1980. *Gnys at wrk: A child learns to write and read*. Cambridge, MA: Havard University Press.
- Bodrova, E., and D.J. Leong. 1998. Scaffolding emergent writing in the zone of proximal development. *Literacy Teaching and Learning* 3: 1-18.
- Bowman, M., and R. Treiman. 2004. Stepping stones to reading. *Theory into Practice* 43: 295-303.

- Burns, M.S. and R. Casbergue. 1992. Parent-child interaction in a letter-writing context. *Journal of Reading Behaviour* 24: 289-312.
- Cabell, S.Q., L.M. Justice, T.A. Zucker, and A.S. McGinty. 2009. Emergent name-writing abilities of preschool-age children with language impairment. *Language, Speech & Hearing Services in Schools* 40: 53-66.
- Chan, L., C. Zi Juan, and C. Lai Foon. 2008. Chinese preschool children's literacy development: from emergent to conventional writing. *Early Years* 28: 135-48.
- Clay, M.M. 1975. *What did I write?* Portsmouth, NH: Heinemann Educational Books.
- Dodici, B.J., D.C. Draper, and C.A. Peterson. 2003. Early parent-child interactions and early literacy development. *Topics in Early Childhood Special Education* 23: 124-36.
- Elliott, E. M., & Olliff, C. B. (2008). Developmentally appropriate emergent literacy activities for young children: Adapting the early literacy and learning model. *Early Childhood Education Journal* 35: 551-556.
- Gentry, J.R. 2005. Instructional techniques for emerging writers and special needs students at kindergarten and grade 1 levels. *Reading and Writing Quarterly* 21: 113-34.
- Justice, L.M., S. Chow, C. Capellini, K. Flanigan, and S. Colton. 2003. Emergent literacy intervention for vulnerable preschoolers: Relative effects of two approaches. *American Journal of Speech-Language Pathology* 12: 320-32.

- Kamberelis, G and Perry. M. (1994). A microgenetic study of cognitive reorganization during the transition to conventional literacy. In D. F Lancy (Ed. Children's emergent literacy: From research to practice (pp. 93-123). Westport, CN: Praeger.
- Lavine, L.O. 1977. Differentiation of letterlike forms in prereading children. *Developmental Psychology* 13: 89-94.
- Mayer, K. 2007. Emerging knowledge about emerging writing. *Young Children* 62: 34-40.
- Neumann, M.M. 2007. *Up Downs: A fun and practical way to introduce reading and writing to young children aged 2-5*. Sydney: Finch.
- Neumann, M.M., M. Hood, and D.L. Neumann. 2009. The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal* 36: 313-19.
- Neumann, M.M., and D.L. Neumann. (2009). More than just story books: Promoting emergent literacy skills in the home environment. *Childhood Education*, 85, 257-259.
- Otto, B. 2008. *Literacy development in early childhood: Reflective teaching for birth to age eight*. New Jersey: Pearson Education.
- Stellakis, N., and M. Kondyli. 2004. The emergence of writing: Children's writing during the pre-alphabetic spelling phase. *Educational Studies in Language and Literature* 4: 129-50.

Temple, C.A., R.G. Barnes, and N.A. Burris. 1982. *The beginnings of writing*. Boston, MA: Allyn and Bacon Inc.

Vygotsky, L.S. 1978. *Mind and society: The development of higher mental processes*. Cambridge: Harvard University Press.

Wood, C. 2002. Parent-child preschool activities can affect the development of literacy skills. *Journal of Research in Reading* 25: 241-58.

Wordern, P., and W, Boettcher. (1990). Young Children's acquisition of alphabet knowledge. *Journal of Reading Behaviour*, 22: 277-295.

Yamagata, K. 2007. Differential emergence of representational systems: drawings, letters and numerals. *Cognitive Development* 22: 244-57.

Yang, H., and A.M. Noel. 2006. The developmental characteristics of four- and five-year-old preschoolers' drawing: An analysis of scribbles, placement patterns, emergent writing, and name writing in archived spontaneous drawing samples. *Journal of Early Childhood Literacy* 6: 145-62.

## Chapter 5 Prelude

### **Mother-Child Referencing of Environmental Print and its Relationship with Emergent Literacy Skills and Home Literacy (Study 3)**

Study 3 is currently under revision by an internationally peer-reviewed journal. Case Studies 1 and 2 demonstrated that environmental print can be used by parents to support emergent literacy development in the home. Previous studies (Purcell-Gates, 1996; Teale, 1986) have also observed general print use by families in the home and found that highest print use was around entertainment activities (e.g., T.V guides, board games) followed by daily living routines (e.g., reading product labels). However the frequency of environmental print interactions at the word and letter level (e.g., when reading grocery product labels) by individual family members (parents/children) and descriptions of how these are used to extend children's literacy learning requires further investigation.

Thus, one aim of Study 3 was to observe and describe naturally occurring mother-child interactions with environmental print in a larger sample of participants ( $N = 35$ ). Mother-child dyads were videotaped interacting within an environmental print rich grocery shop setting for 15 minutes. There were no instructions regarding environmental print; they were simply asked to play with their child. This ensured as natural a setting as possible, without observing in the homes. It also ensured more uniform surrounding print than would have occurred if the observations were conducted in the homes. Environmental print strategies used were coded as demonstrating, labelling letters by their names and sounds, giving directions, extending learning experiences, and providing positive feedback. Thus, both frequency and type of environmental print referencing were recorded. Some multisensory strategies (e.g., visual-auditory-tactile) were also observed in mothers who

referenced environmental print such as pointing out and touching letters whilst saying their names and sounds and repeatedly tracing print on a sign with a finger.

The second aim was to examine the relationships between environmental print referencing and children's emergent literacy skills. If environmental print referencing fosters emergent literacy, children of mother's who engage in this more frequently would be expected to show more developed skills. The final aim of this chapter was to determine if there was consistency between maternal self-reporting of their use of environmental print and the observational data, as self-report questionnaires may be subject to social desirability responses (Dodici, Draper, & Peterson, 2003). Mothers completed a home literacy questionnaire which asked about the frequency with which they engaged in behaviours involving environmental print in the home (e.g., pointing out words on signs). Scores on this were then correlated with observed frequency of referencing environmental print in the play setting.

This study provided evidence of how mothers naturally use environmental print to scaffold their child's emergent literacy learning. Environmental print referencing was also found to relate to aspects of emergent literacy postulating that the use of environmental print as a literacy learning tool may contribute to emergent literacy development. However, to draw conclusions about causality, there is a need for intervention studies to investigate the benefits of using environmental print to directly scaffold emergent literacy. These environmental print strategies could potentially be used to foster emergent literacy skills and print motivation. Finally, the finding that maternal home use of environmental print was not correlated with environmental print referencing in the play setting suggests that parent questionnaires may be subject to social desirability bias. Therefore, observational

research may not only offer a rich view of mother-child interactions with environmental print but also provide a valid measure of maternal environmental print use.

**Statement of contribution to Chapter 5 co-authored paper under review**

**Neumann, M. M., Hood, M., & Ford, R. (under review). Mother-child referencing of environmental print: relations with emergent literacy skills and home literacy.**

This chapter includes a co-authored paper under review. The bibliographic details of the co-authored paper, including all authors, are: Michelle. M. Neumann, Dr Michelle Hood, Dr Ruth Ford.

My contribution to the paper involved the literature review, writing of the paper, data collection, and statistical analyses. The co-authors provided review of drafts and supervisory advice. Thank you to research assistant Rebecca Dale for her inter-rater assistance.

Name of Student: Michelle Neumann

(Signed)

Corresponding authors of the paper:

Name of Corresponding Authors:

(Countersigned) Dr Michelle Hood

(Countersigned) Dr Ruth Ford

(Countersigned) Dr Michelle Hood

Supervisor: Name of Supervisor



## **Chapter 5**

### **Mother-child Referencing of Environmental Print and its Relationship with Emergent Literacy Skills and Home Literacy**

Michelle M. Neumann, Michelle Hood, & Ruth M. Ford

School of Psychology, Griffith University, QLD 4222, Australia

Please direct correspondence to:

Michelle Neumann: School of Psychology, Gold Coast Campus, Griffith University, QLD  
4222, Australia. E-mail: [michelle.neumann@griffithuni.edu.au](mailto:michelle.neumann@griffithuni.edu.au)

Facsimile: +61(0)7 5552 8291, Telephone: +61(0)7 5552 8052

### Abstract

This study investigated the ways in which mothers naturally refer children to environmental print and whether environmental print referencing by mothers and children was related to children's emergent literacy and home literacy. Mother-child dyads ( $N = 35$ ) were videotaped interacting in an environmental print-rich grocery shop play setting and the frequency of naturally occurring environmental print referencing was coded. Children were assessed on measures of emergent literacy skills (letter name and sound knowledge, print concepts, phonological awareness, letter and name writing, environmental print reading) and print motivation, and details about home literacy practices were obtained from a parent questionnaire. Not all mothers and children referenced environmental print during their play. Those that did pointed out environmental print words more frequently than letters. Mothers used various strategies when referencing environmental print (demonstrating, labelling, direction-giving, extending and/or feeding back strategies). Greater maternal environmental print referencing in the play setting was related to higher scores on print concepts, letter and name writing, and home story book reading (as measured by the Child Title Checklist). Children who referenced environmental print in the play setting had mothers who reported more frequent pointing out of letters and words during home story book reading. These findings suggest that maternal environmental print referencing has the potential to scaffold emergent literacy development in young children.

*Keywords:* mother-child environmental print referencing, emergent literacy, home literacy, scaffolding, preschoolers

## **Mother-child Referencing of Environmental Print and its Relationship with Emergent Literacy Skills and Home Literacy**

Environmental print is ubiquitous surrounding non-continuous print in context that fulfils real life functions (e.g., product labels and signs; Adams, 1990; Hall, 1987; Horner, 2005; Otto, 2008; Vukelich, Christie, & Enz, 2008). It has been argued to play a role in children's acquisition of emergent literacy skills such as print concepts, alphabet knowledge (letter name and sound knowledge), and phonological awareness (Lomax & McGee, 1987; McGee, Lomax, & Head, 1988; see Neumann, Hood, Ford, & Neumann, in press, for a review). These underpin future reading ability, which, in turn, is related to long-term academic outcomes (Adams, 1990; Snow, Burns, & Griffin, 1998). This relationship between environmental print referencing and emergent literacy might arise because the colourful and attractive nature of environmental print helps children construct their knowledge about written language (Gerard, 2004; Goodman, 1986; Harste, Burke, & Woodward, 1981; Whitehurst & Lonigan, 1998).

Case studies have reported that parents often point out environmental print to their children and that children respond positively to this (Baghban, 1984; Lass, 1982; McGee & Richgels, 1989; Neumann, Hood, & Neumann, 2009; Neumann & Neumann, 2010; Sinclair & Golan, 2002). For example, at two years of age Luc was observed to point out product labels such as 'Glaces' ice-cream and letters embedded in supermarket logos after his parents had previously drawn the labels to his attention (Sinclair & Golan, 2002). Harste et al. (1981) described how a father pointed out a road sign "West 465" to his 3-year-old daughter on the way to the zoo asking her what it says. She responded by saying "It says

Daddy turn right to go to the zoo” (p 325). Although Alison read the sign logographically (using the visual cues not letter-sound analysis skills; Frith, 1985), she was gaining meaning from the print which is an important component of emergent literacy (Whitehurst & Lonigan, 1998).

As it had been established that children’s literacy learning begins at home with surrounding environmental print (e.g., Mason, 1980), Teale (1986) further examined the types and frequency of natural parent-child interactions with print in the home. Twenty-four preschool children (aged 2.5 – 3.10 years) from 22 low income homes (2 families had twins) were systematically observed interacting with print materials found in the home over a period of 3 to 18 months. Children and their parents engaged with a wide variety of print including product labels, book print, newspapers, and TV guides. The highest frequency of print interactions occurred during daily living routines such as shopping and cooking, followed by entertainment activities such as reading board game rules. Story book reading was the least frequent literacy activity. Teale also reported wide variability in the overall frequency and types of print interactions as some families rarely referenced print and others did it quite frequently. It was concluded that spontaneous daily interactions with functional surrounding print at home (e.g., advertisements, labels, bills) are important to children’s emergent literacy development. Teale also posed questions requiring further investigation about the nature of these types of adult-child interactions and how this impacts upon literacy learning.

To extend Teale’s study, Purcell-Gates (1996) investigated the relationship between print-related activities in the home and emergent literacy knowledge. Purcell-Gates (1996) observed and described the types and frequencies with which 20 low SES families (24

children aged 4 - 6 years) used print in the home over a 12 month period (e.g., environmental print, story book reading, writing) and how this was related to children's emergent literacy knowledge. Most print related activities occurred around entertainment activities (e.g., reading a flyer advertisement, TV guide) closely followed by daily living routines (e.g., reading grocery product labels such as on cereal boxes or milk cartons) at the word or phrasal level. The frequency of reading these types of print by families (there was no differentiation in the referencing by mother/father or child) was related to children's knowledge of the alphabetic principle (based on asking them to spell words on paper). In contrast, story book reading and home writing were related to print concepts (Clay's Concepts about Print Test, 1979) and writing ability (children were asked to write their name and anything else they could). Similar to Teale's (1986) findings, Purcell-Gates noted great variability in the type and frequency of literacy events across the families. These studies show the important role that parent-child interactions with environmental print play in the construction children's knowledge about written language.

Vygotsky's (1978) socio-cultural perspective provides a natural theoretical framework within which to understand these parent-child literacy interactions (Clarke-Stewart & Beck, 1999; Dodici, Draper & Peterson, 2003; Trawick-Smith & Dziurgot, 2011; Vandermaas-Peeler, Nelson, Bumpass & Sassine, 2009). Within each literacy interaction, parents can provide enough guidance as is necessary to scaffold the child's movement within their zone of proximal development, which is the space between a child's level of mastery with and without assistance (Wood, Bruner, & Ross, 1976). Scaffolding refers to the process of using tools or techniques to allow a child to achieve a goal that would otherwise be beyond his or her unassisted efforts and these supportive learning tools

are gradually removed as the child gains mastery of a task (Bodrova & Leong, 2007; Wood et al., 1976). For example, a case study by Neumann et al. (2009) described how a mother pointed out individual letters in environmental print (e.g., cereal box labels) to help her child learn about letter names, shapes, and sounds. In addition, the mother encouraged her child to trace letters in the environmental print with his finger. It was reported that these scaffolding strategies increased the child's letter knowledge and print motivation. When the child had mastered a letter, the mother no longer needed to use the tracing strategy for that letter as the child initiated his own identification of letters he found in surrounding print.

In summary, the small body of existing research on environmental print referencing has shown that parents spontaneously and naturally draw their children's attention to environmental print during daily activities, and that there are positive associations between the frequency of environmental print referencing and children's developing alphabetic and print knowledge. The present study took the form of an observational study of environmental print referencing between mothers and their young children (3 to 4 year olds). We focused on mothers rather than other caregivers because mothers are the majority of the parent samples used in previous studies of parental involvement in early childhood literacy (e.g., Aram & Levin, 2001; Aram, 2002; Justice & Ezell, 2000). Importantly, our study aimed to extend current understanding of the relationship between mother's and children's referencing of environmental print and children's emergent literacy and home literacy practices in three main ways.

First, observations were made within the context of an environmental print-rich grocery shop play setting rather than in the family's homes to ensure each mother-child dyad were exposed to the same type and quantity of environmental print. Also, mother-

child dyads were able to play naturally (unaware that the study was investigating use of environmental print) without the presence of distractions that would typically occur at home. The setting also maximized their opportunities to engage with environmental print. Print rich play settings have been designed by other researchers to replicate literacy contexts from the outside world in order to investigate naturally-occurring literacy behaviours (e.g., Justice & Pullen, 2003; Neuman & Roskos, 1993; Vukelich, 1994). Moreover, direct observation of play interactions allows the effective examination of freely occurring behaviours or events and has become a major observational technique of child development research (e.g., Irwin & Bushnell, 1980; Purcell-Gates, 1996; Teale, 1986). The observational strategy adopted for this current study was ‘event sampling’, which involves counting the frequency of a particular pre-coded behaviour as it spontaneously occurs and recording narrative descriptions of these specific interactions (Irwin & Bushnell, 1980). An advantage of this observational method is that it provides a realistic snap shot of how mother-child dyads naturally interact with surrounding print. Also, observable parent-child interactions are thought to provide a more ecologically valid measure of literacy behaviours than self-report questionnaires (Dodici et al., 2003; Vandermaas-Peeler et al., 2009).

To date little is known about the specific nature of mother and child interactions with environmental print as previous studies have focused on general family print interactions (Purcell-Gates, 1996; Teale, 1986) of which environmental print is only one form. Also, previous environmental print play-based studies have investigated adult-child interactions in preschool settings (Neuman & Roskos, 1993; Vukelich, 1994) but no studies (apart from case studies; e.g., Neumann et al., 2009) to our knowledge have examined

environmental print strategies mothers naturally use to scaffold emergent literacy learning. Therefore, our study sought to provide detailed descriptions of the strategies mothers naturally use when referencing environmental print letters and words to their children. These findings may, in turn, aid in the design and implementation of future home literacy intervention programs.

Second, children were assessed on a comprehensive battery of tests of their emergent literacy skills, including print concepts, phonological awareness, letter name and sound knowledge, name and letter writing, and environmental print reading. They were also tested for print motivation, which is an important indicator of a child's interest in print-related activities (Baker & Scher, 2002). These measures are important components of emergent literacy development (Whitehurst & Lonigan, 1998). Purcell-Gates (1996) only assessed a narrow range of emergent literacy skills so to date it is not known how environmental print referencing is related to this wider range of skills.

Third, mothers were asked to complete a questionnaire regarding home literacy practices; for example, how often they teach their child about letters and words, and point out environmental print. This allowed us to determine whether mother's self-reporting of home environmental print referencing was related to their behaviours observed in the play setting. It also allowed us to explore the relations between home literacy practices and the frequency of environmental print referencing observed in the play setting, as this has not been examined before. Furthermore, previous studies have not specifically controlled for these home practices.



It was hypothesized that mothers who referenced environmental print more frequently in the play setting would report more frequent use of environmental print in their homes and more frequent engagement in other literacy-related practices such as teaching of letters and words. We also expected that more frequent environmental print referencing by mothers, either in the play setting or as self-reported at home, would be related to children having higher emergent literacy skills and print motivation and engaging in more environmental print referencing themselves. Finally, it was expected that children who referenced environmental more frequently themselves would have higher emergent literacy skills and print motivation.

## **Method**

### **Participants**

The sample consisted of 35 mother-child dyads (15 boys, 20 girls). The children were recruited from six childcare centers on the Gold Coast, Queensland, Australia. At these childcare centers, there is no formal instruction in reading or writing but there are informal play-based literacy activities (e.g., shared story book reading, drawing, singing nursery rhymes). To be eligible to participate in this study, children ( $M$  age = 4.30 years;  $SD = .47$ ; range = 3.36 – 4.98 years) were required to have English as their main language and to obtain a minimum standard score of 80 on the Peabody Picture Vocabulary Test 4<sup>th</sup> Edition (PPVT-IV; Dunn & Dunn, 2007) to ensure typical development of language skills. Children with any serious developmental problems as indicated by parent questionnaire (e.g., speech, language, eyesight or hearing problems or chronic ear infections) were not

eligible to participate. One child was too shy to complete any of the assessments so was also excluded, resulting in the final sample of 35.

Most mothers were married or in a de facto relationship (91.4%). Of the remainder, 2.9 % were divorced or separated and 5.7 % reported never being married or in a de facto relationship. Family socio-economic status (SES) was calculated using the Hollingshead 4-factor Index (Hollingshead, 1975) based on parental educational level and occupational status. The mean SES fell in the middle SES range of 40 to 54 ( $M = 51.26$ ;  $SD = 8.18$ ; range 34 - 63). Mother's and father's highest education levels ranged from 10<sup>th</sup> or 11<sup>th</sup> grade to postgraduate training, with 14.3% of mothers and 2.9% of fathers being high school graduates, 37.1% of mothers and 20% of fathers having completed undergraduate degrees, and 17.1% of mothers and 5.7% of fathers having postgraduate training. The modal occupational status was professional for mothers (34.3%) and associate professional for fathers (31.4%).

## **Procedure**

Ethical approval for the study was granted by the university ethics committee. Consent to conduct the study in their childcare centre was obtained from the directors. Mothers provided signed consent for themselves and their child to participate and completed a questionnaire regarding demographic details and home literacy activities. Mothers were informed that the study was about how mothers play with their children and how this was related to their child's literacy development. There was no indication that the play session was related to use of environmental print. Mother and child engaged in the play session, which was videotaped, and then the child completed the literacy assessments

on the same day in a quiet room at the child's center. Each child was individually assessed on print concepts, phonological awareness, letter name and sound knowledge, name and letter writing, environmental print reading, print motivation, and receptive vocabulary. Praise was given for on-task behaviour but no corrective feedback was provided. Children were thanked with stickers at the completion of the assessments.

**Video Play Session.** Each mother-child dyad was asked to play in the grocery shop setting for 15 minutes. The only instruction given by the researcher to each mother-child dyad was "*Please play naturally with your child for 15 minutes in this grocery shop play setting. I will be videoing it because we are interested in how mother's play with their children*". The researcher remained in the room to videotape the mother and child's interactions. Verbal and non-verbal environmental print references were later coded to determine the mother's and child's frequency of interactions with environmental print letters and words.

### **Materials**

A small corner of a room at each child care centre was fitted with grocery play props (15 items of plastic fruit/vegetables/bread) and grocery items with salient print on the labels (e.g., cereal boxes). There were four signs that had the names and prices of grocery items (e.g., DRINKS \$3). There was also an OPEN/CLOSED sign, posters advertising products, shopping bags, wallets, a toy cash register, play money, a small shopping basket, and shelving for the grocery items. Figure 1 shows a photo of the environmental print items in the grocery shop setting.



Figure 1. Environmental print items used in the grocery shop play setting.

## Measures

**Concepts About Print test.** (Clay, 2005). This test has good reliability (split half reliability of .84 - .89) and acceptable validity (.64 - .79; Brassard & Boehm, 2007).

Twenty items suitable for non-reading preschool aged children were selected to assess awareness of and knowledge about print. The first 10 items assessed general book handling and print concepts (e.g., the front of the book, where to start reading). The next 10 items tested letter, word, and punctuation concepts (e.g., identifying the first letter in a word; a capital letter). The test was administered by reading a storybook (Stones; Clay, 2008) to the child while asking the questions. Only 9 of the 20 items (5 for general book handling and 4 for letter and word concepts) showed acceptable internal consistency (Cronbach's  $\alpha = .71$ ). One point was given for each correct answer (max = 9).

**Letter name and sound knowledge.** Twenty-six upper case letters were presented to children in random order, printed in black Century Gothic font size 72 on individual 8 x 8 cm white cards. They were asked the name and sound of each letter. One point was given for each correct answer (max = 26 each for name and sound scores).

**Phonological awareness.** Three tasks were used to assess phonological awareness. The rhyme detection test was based on Muter, Hulme, Snowling, and Taylor (1997). Four words were presented in picture form and named by the researcher. The child was asked to point to one of three pictures that rhymed with the target picture. There were three initial practice items on which corrective feedback and explanation was provided followed by 10 trials. A point was given for each correct response (max = 10). The initial and final phoneme detection tests were based on Bowey (1994) and used a similar methodology. Four words were presented in picture form. Children were asked to identify the word that started with the same sound as the target word (initial phoneme detection task) or to identify the word that ended with the same sound as the target (final phoneme detection task). For each task, there were 2 practice trials with corrective feedback and explanation, followed by 10 trials. Correct scores on the rhyme, initial, and final phoneme tasks were summed to form a total phonological awareness score. There was acceptable internal consistency (Cronbach's  $\alpha = .75$ ).

**Writing.** Children were asked to write their name first, then all of the letters they could in one minute. The name writing samples were scored using a 7-point scale adapted from Bloodgood (1999) and Welsch, Sullivan, and Justice (2003) (see Appendix B). For letter writing, each conventional letter written scored 1 point (repeated letters were scored once only and upper and lower case letters were scored 1 point each e.g., D and d).

Controlled and/or linear scribbling such as drawings, dots, circles, or lines with no discernible letters present was scored as zero. The number of conventional letters written was tallied to give a total letter writing score.

**Environmental print reading.** This task was adapted from Hiebert (1978).

Children were shown 10 environmental print items (e.g., MILO, FROOT LOOPS, CORN FLAKES, RICE BUBBLES, NUTRI-GRAIN, PEPSI, STOP, LEGO, EXIT, SNICKERS) in random order in full context (e.g., on a cereal box). Environmental print words selected were based on those found in the children's local area and used in previous studies (e.g., Kuby, Aldridge, & Synder, 1994; Masonheimer, Drum, & Ehri, 1984). The researcher pointed to and ran a finger under the word asking, "What does this say?" Children scored two points for reading the item correctly (e.g., "Pepsi"), one point for a meaningful attempt (e.g., "drink" for Pepsi) and zero for an incorrect response (max = 20).

**Print motivation.** The print motivation assessment was adapted from Baker and Scher's (2002) Motivations for Reading Scale. Five questions were used to measure children's print motivation (I like it when someone reads me a book; I like to read books by myself; I think reading is boring/fun; I like to find out new things from books; I am good at reading books). There was one interspersed filler item (I like to brush my teeth). Two puppets were used. One was portrayed as having a positive attitude to the literacy activity and the other a negative view (e.g., "Harry likes to read books, Larry does not"). The child was asked who they are most like ("Are you more like Harry or Larry?"), then whether they were "a little" or "a lot" like the puppet selected. This provided a 4-point response format, with higher scores indicating higher motivation (max = 20). Baker and Scher argued that

this response format reduces socially desirable responding. Cronbach's  $\alpha = 0.85$  for print motivation.

**Receptive vocabulary.** The PPVT-IV (Dunn & Dunn, 2007) was used for screening children's receptive vocabulary. It is normed for 2.5 to over 90 years of age. The child selects one of four pictures that best represents a word spoken by the examiner. Dunn and Dunn (2007) reported high split-half reliabilities (around .94).

**Home literacy questionnaire.** This was adapted from Hood, Conlon, and Andrews (2008) and contained questions about the family and home literacy. Demographic questions asked about parents' marital status, age and gender of the child, and maternal and paternal education and occupation. Literacy items were responded to on a 6-point Likert scale where 1 = *never* to 6 = *several times daily*. There were three items for child's home environmental print referencing (e.g., how often the child asks what words on signs and labels say; Cronbach's  $\alpha = .64$ ), three items for maternal home referencing of environmental print (e.g., How often do you or another family member point out environmental print letters; Cronbach's  $\alpha = .93$ ), three items for teaching of letters and words during daily informal activities (e.g., How often do you or another family member teach the child the sounds of letters?; Cronbach's  $\alpha = .85$ ), six items for teaching of letters and words during book reading (e.g., When I read to my child I ask him/her what certain letters are; Cronbach's  $\alpha = .90$ ).

The parent questionnaire also contained a Children's Title Checklist (CTC). This book familiarity test is reported to reflect valid parent literacy behaviours such as home story book reading (Echols, West, Stanovich, & Zehr, 1996). The 20 titles were selected

from Angus and Robertson Bookworld's 100 all-time favourite children's books (2006) along with titles from Cunningham and Stanovich (1993). These were randomly interspersed with 10 foils (made up titles). Mothers were asked to indicate which titles they recognized. The score was the proportion of real titles picked minus the proportion of foils picked. This scoring technique prevents response bias. The percentage of mothers who recognized each title is listed in Appendix C.

**Socio-Economic Status (SES).** SES was calculated using the Hollingshead Four-Factor Index of Social Status (Hollingshead, 1975) based on weighted averages of each parent's highest education level (from 1 = < 7<sup>th</sup> grade to 7 = *post-graduate training*; Bornstein & Bradley, 2003) and occupational status (9-point Australian Classification of Occupations, ASCO, was used as it is better suited for classification of Australian occupations than the original Hollingshead classification SES). Scores can range from 8 to 66, with higher scores indicating higher SES.

### **Environmental Print Referencing**

For each video session, transcripts of all environmental print-related utterances and behaviours were made for each mother and child dyad by the first author. The print referencing criteria applied was adapted from Justice and Ezell (2000; Ezell & Justice, 2000). When a mother or child attended to a letter or word in environmental print (e.g., on a product label or sign) by a verbal, non-verbal, or simultaneous verbal/non-verbal reference, a score of one point was given. This yielded separate total environmental print referencing scores for mother and child. The coding guidelines are detailed below.



- Verbal references could be *Comments* (e.g., That's a letter M, That sign says OPEN, W in Weet-Bix makes a Wuh sound); *Questions* (e.g., What do you think this says? Can you see a D in that sign? Which word says fruit?); or *Requests* (the child is asked to perform an action or complete a task, e.g., Show me how much the fruit is; Show me where it says CORNFLAKES; Look at the word on that sign).
- Non-verbal references involved mother and/or child simultaneously visually attending to the print whilst pointing to or tracking the word/letter. For example, when pointing to print the mother's/child's finger touched the environmental print and extended towards, on, or near the word or letter, or when tracking print the mother ran her finger along or underneath the word.
- Simultaneous verbal and non-verbal references. For example, the mother pointed to environmental print while saying, "That says CORNFLAKES" or tracked the environmental print with her finger while reading it (e.g., "Veges one dollar").

Nonverbal and verbal behaviours that were a result of general product handling were not scored if there was no verbal and/or non-verbal reference to the print. For example, a mother saying "We need some Weet-Bix for breakfast" while taking it off the shelf but not specifically referencing the word "Weet-Bix" was considered general product handling and not environmental print referencing. If the environmental print consisted of more than one word (e.g., RICE BUBBLES) then it was scored as one unless the participant specifically referred to each word separately. If a participant pointed to a sign and read the whole sign it was scored as one environmental print reference.

The environmental print interactions were classified into five different types based on Neuman and Rosko's (1993) typology of adult-child print strategies. These were (a)

*demonstrating*, the mother shows the child how to complete a literacy task (e.g., the mother modelled how to sound out a word or find a letter; (b) *labelling*, the mother explicitly references environmental print (e.g., the mother pointed to a label saying, “That word says MILO” or labels a letter using its name or sound); (c) *direction-giving*, the mother asks the child to perform a specific task that would lead to a literacy behaviour (e.g., the mother says to the child, “Look at the sign and tell me if the shop is open or closed” or asks the child to name a letter or make its sound); (d) *extending*, the mother expands on what the child already knows about the print (e.g., the mother says, “Cancel (a label on the cash register) starts with C, what other words start with C?”); and (e) *feeding-back*, the mother acknowledges or praises the child’s literacy attempts.

To determine inter-rater reliability of the environmental print referencing, 28.6% of the 35 video sessions (10 sessions) were randomly selected and scored by both the first author and a trained research assistant who was not otherwise involved in the study. Using this percentage of sessions for inter-rater reliability is consistent with previous studies (e.g., Ezell & Justice, 2000; Justice & Ezell, 2000). Inter-rater reliabilities were high; mother letter  $r = 1.0$ , child letter  $r = 1.0$ , mother word  $r = .92$ , child word  $r = .88$ . Following discussion and agreement, and because inter-rater scores were similar, the first author’s scores were used.

## **Results**

### **Mother-Child Referencing of Environmental Print**

Initial descriptive statistics showed that mothers and children do naturally point out letters and words in environmental print when playing in a print-rich setting. Eleven percent

of mothers ( $n = 4$ ) and 8% of children (2 girls and 1 boy) referenced letters within environmental print. A higher percentage of mothers (66 %,  $n = 23$ ); 15 with daughters and 8 with sons and children (37 %; 11 girls and 2 boys) referenced words in environmental print. Thirty-one percent of mothers ( $n = 11$ ) and 63% of children ( $n = 22$ ) did not reference any letters or words. Table 1 shows the different types of environmental print that were referenced in the play setting. The most popular type of environmental print referenced by participants was grocery signs that contained the name of the general item and its price (e.g., Fruit \$1).

Table 1

*Types of Environmental Print Referenced*

Environmental print	Percent of Total Environmental Print References
Grocery signs (e.g., Fruit sign)	57%
Print on grocery products (e.g., Weet-Bix)	15%
Labels on cash register (e.g., ACCEPT)	11%
Print on shop posters (e.g., Paddle Pop)	10%
Shop signs (e.g., OPEN/CLOSED)	7%

**Microanalysis of Mother-Child Letter Referencing**

All mother-child environmental print interactions from the narrative data were classified into the five types of interactions described in the materials section (Demonstrating, Labelling, Direction-giving, Extending, Feeding-back). These transcripts

provide evidence of the types of print strategies used by mothers and how mothers and their children interacted with the environmental print.

As noted earlier, only a small number of mothers ( $n = 4$ ) and children ( $n = 3$ ) referenced letters in the environmental print rich play setting. There was also striking variability in the frequency with which different mothers and children pointed out letters. For example, of the 4 mothers who referenced letters, one mother referenced them 12 times, one mother referenced them twice, and two mothers only referenced letters once during the 15 minute play session. During these environmental print interactions, all the children responded to their mother's referencing of letters. Below are examples of mother-child interactions with environmental print letters.

*Demonstrating.*

[The child was holding the SHAPES biscuit box. The mother pointed to the first letter]

Mother: "Do you know this letter? What is it?"

Child: "S" (letter name).

Mother: "The word says SHHH...."

[The mother pointed to the next letter]

Mother: "The H behind the S makes it be quiet – it says SH" (she makes the sound SHHH).

[The mother ran her finger under the word]

Mother: "Shapes".

Child: "Shapes"

*Labelling.*

[The child picked a cereal box off the shelf and gave it to the mother].

Mother: "What are they?" (whilst looking at the front of the cereal box).

[The child looked at the front of the box]

Child: "I don't remember".

[The mother held the box and pointed to the print on the box for the child to see]

Mother: "It starts with RRRRR (she makes the letter sound)".

[The child looked at the print].

Mother: "Rice Bubbles".

Child: "Rice Bubbles".

[The mother pointed to the W on the Weet-Bix box]

Mother: "What sound?"

Child: "Da, da".

[The mother immediately corrected the child]

Mother: "Wuh, Wuh".

[The child repeated the correct letter sound].

Child: "Wuh, Wuh".

*Direction-Giving.*

[The mother held up the milk bottle]

Mother: "Do we have a price for milk?"

[The child looked at the price signs]

Child: "There's supposed to be an M for milk".

[The child pointed to a Fruit sign (as she looked for an M)].

Mother: "Some people drink milk as a drink so which one says drink?"

[The child tried to sound out drrrr and pointed to the drinks sign]

Child: "This one?"

Mother: "Is that a D?"

[The mother said the D sound emphasizing the sound]

Mother: "DDDrinks".

[The child looked at the sign and nodded her head]

Child: "DDD".

Mother: "Buy me something with a letter R in it so we can buy something with your name.

So tell me whenever you see an R".

[The child looks around at the signs and pointed to the R in the FRUIT sign].

Child: "I found it".

Mother: "Yes!"

*Extending.*

[The mother and child looked at the keypad on the cash register and the mother points to a key].

Mother: "Can you see where it says on, that says off, and that says cancel C (letter name)

C for cancel".

[The mother looks at the child and points to the cancel button]

Mother: "C for ..., who else has got a C?"

Child: "Caleb".

[The mother pointed to the word Weet-Bix on the cereal box]

Mother: "Wee".

[The mother pointed to the next letter in the word helping the child sound out the word].

Mother: "What's that sound, have a look."

Child: "Weet".

[The mother continues pointing to the print].

Mother: "What's this letter?"

[The child looks at the letter]

Child: "B" (letter name).

*Feeding-back.*

[The mother pointed to the Weet-Bix cereal box label]

Mother: "Weeetuhbuh..., what's that sound have a look".

Child: "I" (letter name).

Mother: "Weeetuhbuhiiix".

Child: "Weet-Bix".

Mother: "Good girl".

[The mother pointed to the sign and the child looked at it].

Mother: "What does drinks start with?"

Child: "D" (letter name) and it's two dollars."

Mother: "What does it finish with, what's the last letter?"

[The child looks at the sign and says "S" (letter name)].

Mother: "Well done!"

### **Microanalysis of Mother-Child Word Referencing**

A greater number of mothers ( $n = 23$ ) referenced environmental print words during play than referenced letters ( $n = 4$ ). Of the 23 mothers who referenced words, 13 of the children verbally responded to their mother's word referencing whereas 10 did not.

Examples of maternal word referencing where children did not verbally respond to their mother will be described first.

*Non-responsive child interactions.*

*Demonstrating.*

[The mother ran her finger underneath the cereal sign]

Mother: “Do you notice that up here, that, this word says cereal”.

[The mother pointed again and ran her finger under the word]

Mother: “This word says cereal, this one says cereal, and what number is there?”

[The mother points to the number].

Mother: “I think the cereal is three dollars”.

*Labelling.*

[Mother pointed to word “SPECIALS” then to “IGA” print on the shop poster]

Mother: “Have a look at this, this shop’s name is IGA”.

[The child is busy with the groceries and does not look at the poster or verbally respond to the mother’s word referencing].

*Direction Giving.*

[The mother looks at the OPEN/CLOSED sign]

Mother: “Look the shop is closed. You better turn the sign around because the shop says Closed. We are open”.

[The mother turns it around].

Mother: “The shop is now open ready for business”.

As can be seen in the above examples, mothers provided opportunities for their child to interact with environmental print. However, the lack of a verbal response from the child made the literacy interactions brief and no feeding-back or extending occurred. In contrast, where children initiated print interactions and/or verbally responded to their



mother's word referencing (e.g., asking and answering questions about the print), the interactions were observed to provide a richer print and learning experience for the child. Examples of these mother-child interactions with environmental print words are described below.

***Child responsive interactions.***

*Demonstrating.*

[The child pointed to a grocery sign]

Child: "What are these?"

[The mother pointed to the sign and ran her finger under the word]

Mother: "That says drinks..."

[The child looked at the sign]

Child: "Two dollars".

[The mother pointed to another sign and ran her finger underneath]

Mother: "Cereal costs..."

Child: "Three dollars".

[The child watched the mother turn over the OPEN/CLOSED sign]

Mother: "Look I'm going to turn this over".

Child: "Why?"

Mother: "Because that says closed and my shop is open, I'm going to change it so it says open".

*Labelling.*

[The mother pointed to the label and ran her finger under the word "ACCEPT" that popped up on the cash register. The child looked at it]

Mother: "That says there was enough money on the credit card to pay".

[The child pointed to the label “credit card” on the on the cash register with his finger]

Child: “What does that say?”

[The mother looked at it]

Mother: “That says you can use your credit card – it says credit cards welcome”.

*Direction Giving.*

Mother: “Look up here”.

[The mother pointed to the sign]

Mother: “Grocery shop. What’s up there?”

[The mother pointed to the OPEN/CLOSED sign and turned the sign over]

Mother: “Open”, “Closed”.

Mother: “Is it open or closed?”

[The child looks at the sign]

Child: “Open”.

*Extending.*

[The mother looked and pointed at the OPEN/CLOSED sign].

Mother: “You have to open your shop, it’s saying it’s closed”.

[The child goes to the sign and turns it over].

Mother: “Turn it over, what does it say?”

Child: “Open”.

[The child looked at what the mother was pointing to. The mother pointed to the word Paddle Pop]

Mother: “These are Paddle Pops”.

[The mother pointed to words on the ice-block poster]

Mother: “Oh look at that, what does that sign say?”

[The child looks at it].

Child: “White Water World”.

Mother: “It does say White Water World. Do they have ice-blocks at White Water World?”

Child: “Yes”.

*Feeding-back.*

[The mother pointed to the cereal sign and ran her finger under the word]

Mother: “What’s this one cereal, cereal?”

[The mother pointed to all the cereal boxes]

Mother: “Breakfast these are all for breakfast”.

[The mother pointed to the dollar sign and traced it repeatedly with her finger]

Mother: “What’s this sign?”

[The child pointed to the dollar sign on the fruit sign]

Child: “Same one”.

Mother: “Yes it’s the same, what does it mean?”

Child: “Dollar”.

Mother: “Good girl”.

[The mother points to the sign again]

Mother: “That’s a three so that’s three dollars”.

Child: “three dollars”.

### **Environmental Print Referencing, Emergent Literacy, and Home Literacy**

List-wise deletion was used to account for 5% missing data for demographic items on the parent questionnaire (Rubin, Witkiewitz, St Andre, & Reilly, 2007). There was 0.9% missing data for the literacy items and these scores were replaced by the series median score for the relevant items as suggested for ordinal data by De Vaus (2004). Maternal environmental print referencing, letter sound knowledge, and letter writing were positively

skewed. A square root transformation was applied to normalize these distributions. Print motivation and maternal teaching of print during daily activities and during book reading were negatively skewed. Print motivation required a reflection plus square root transformation and both maternal teaching of print variables required a reflection plus log transformation to normalize this data. The child environmental print referencing data was not able to be transformed to normality due to severe floor effects. Therefore, children were categorized as referencers (coded 1,  $n = 13$ ) or non-referencers (coded 0,  $n = 22$ ).

Table 2 shows descriptive statistics for environmental print referencing, children's emergent literacy skills, screening measure, home literacy practices, and demographics. On average, children knew more letter names than sounds, could write some conventionally shaped letters, and could identify about a third of the environmental print labels tested. Mothers also reported a moderate to high frequency of engagement in home literacy activities. Mothers reported they engaged in home environmental print referencing more frequently than their child did.

Table 2

*Descriptive Statistics for Environmental Print Referencing, Emergent Literacy, Screening Measure, Home Literacy and Demographic Factors*

Measure	Mean	SD	Range
Environmental print referencing in the play setting			
Maternal environmental print references/15 min	3.74	4.69	0-18
Child environmental print references/15 min	0.8	1.69	0-8
Emergent literacy			
Letter name (max 26)	11.40	9.40	0-26
Letter sound (max 26)	3.49	5.07	0-22
Print concepts (max 9)	3.66	1.94	0-9
Phonological awareness (max 30)	12.03	5.02	5-23
Name writing (max 7)	4.71	2.23	1-7
Letter writing	3.65	4.35	0-15
Environmental print reading (max 20)	7.86	3.39	2-15
Print motivation (max 20)	13.31	3.17	5-16
Screening measure			
Receptive vocabulary (standardized score)	106.51	10.30	84-130
Home literacy practices			
Child home referencing of environmental print (max 18)	9.89	3.25	4-16
Maternal home referencing of environmental print (max 18)	12.80	4.39	3-18
Maternal teaching of letters/words daily (max 18)	13.63	3.17	3-18
Maternal teaching of letters/words in books (max 36)	26.29	5.44	7-34
Children's Title Checklist (percent)	48	16	15-80
Demographic factors			
Child age (years)	4.30	0.47	3.36-4.98
SES (possible range 8 to 66)	51.26	8.18	34-63

**Relations Between Maternal Environmental Print Referencing, Emergent Literacy, and Home Literacy Practices**

Age and SES were potential control variables. Correlations between these and all emergent literacy variables were inspected. Only age was significantly correlated with these focal variables and was, therefore, included controlled in subsequent analyses. Table 3 presents partial correlations between maternal environmental print referencing, emergent

literacy, and home literacy practices with age controlled. A 1-tailed level of significance was used throughout to optimize power and because it was hypothesized that mothers who referenced letters and words more in the play setting would have children with higher emergent literacy skills and print motivation and self-reported home literacy practices (i.e., specific directional hypotheses).

Maternal environmental print referencing in the play setting was significantly correlated only with print concepts and name and letter writing. Higher frequency referencing of environmental print by the mother was associated with children scoring higher on print concepts that involved skills for book handling and concepts of letters and words, as well as being more skilled at writing their name and individual letters correctly. Interestingly, maternal environmental print referencing was not related to children's ability to read environmental print words.

Maternal environmental print referencing was also significantly related to the Children's Title Checklist measure of mother's familiarity of children's book titles. Thus, mothers who referenced environmental print more in the play setting were also likely to show higher storybook-related literacy behaviour at home. However, it was not related to mother's self-reports of home literacy teaching practices. Unexpectedly, mothers' self-report of the frequency of their own environmental print referencing at home was not related to maternal environmental print referencing in the play setting. Maternal reports of the child's home referencing of environmental print was not related to child's environmental print reading ability or other emergent literacy skills.

Table 3

*Partial Correlations Between Maternal Environmental Print Referencing in the Play Setting, Emergent Literacy, and Home Literacy Practices with Child Age Partialled Out.*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Letter Name	—													
2. Letter Sound Sqrt	.52**	—												
3. Print Concepts	-.04	.15	—											
4. Phonological Awareness	.17	.58**	-.09	—										
5. Name Writing	.23	.14	.15	-.03	—									
6. Letter Writing Sqrt	.15	.08	.05	-.05	.72**	—								
7. EP Reading	.05	.28	-.03	.30*	-.02	.01	—							
8. Print Motivation Rflsqrt	.08	-.03	-.06	-.17	.04	.07	-.19	—						
9. Child Home EP referencing	.28	.05	.21	-.15	.00	-.01	-.16	.01	—					
10. Mat. Home EP referencing	.19	.19	-.05	.09	.16	-.02	.15	-.27	.63**	—				
11. Mat. Home Teach Print Daily RflLog	-.24	-.16	.40**	-.14	-.13	-.00	-.11	-.04	-.35*	-.66	—			
12. Mat. Home Teach Book Print RflLog	-.42**	-.24	-.30*	.01	-.23	-.17	.00	-.14	-.62*	-.59	.36	—		
13. CTC	.31*	.35*	.21	.11	.25	.15	-.04	.28	.28	.13	-.08	-.20	—	
14. Maternal EP Referencing Sqrt	.20	.12	.30*	-.03	.49**	.36*	-.01	.19	-.20	-.09	.16	-.02	.30*	—

*Note.* Sqrt = Square Root, Rflsqrt = reflect square root, RflLog = reflect log, EP = Environmental Print, Mat. = Maternal, CTC = Children's Title Checklist. Variables 1-8 = Emergent literacy measures, Variables 9-13 = Home literacy practices, Variable 14 = Maternal environmental print referencing in play setting. 1-tailed, \*p < .05; \*\* p < .01

### Child Environmental Print Referencing

Due to children's environmental print referencing in the play setting being a categorical measure, independent samples *t*-tests were used to compare differences between referencers and non-referencers on emergent literacy and home literacy variables. The descriptive statistics are given in Table 4. Only one *t*-test showed a significant difference such that children who referenced environmental print more had mothers with higher maternal home teaching of book print (pointing out letters and words during home story book reading),  $t(33) = -2.11, p = 0.04, d = .89$ . There was one marginal difference such that children who referenced environmental print wrote more letters than children who did not reference environmental print. However, this failed to reach significance,  $t(33) = -1.79, p = 0.09, d = .66$ . There were no significant differences on any other emergent literacy skill or home literacy variables.

Table 4

#### *Descriptive Statistics of Children who did and did not Reference Environmental Print*

Variable	Referencers ( $n = 13$ )		Non-referencers ( $n = 22$ )	
	Mean	<i>SD</i>	Mean	<i>SD</i>
Letter name	11.85	(10.13)	11.14	(9.18)
Letter sound	3.38	(4.96)	3.55	(5.25)
Print concepts	3.77	(2.49)	3.59	(1.59)
Phonological awareness	12.62	(5.09)	11.68	(5.07)
Name writing	5.08	(2.36)	4.50	(2.18)
Letter writing	5.46	(5.11)	2.60	(3.54)
Print motivation	13.31	(3.40)	13.32	(3.11)
EP reading	7.46	(3.62)	8.09	(3.31)
Child home EP referencing	10.31	(2.46)	9.64	(3.67)
Maternal home EP referencing	14.15	(3.34)	12.00	(4.80)
Maternal home teach print daily	13.92	(3.68)	13.45	(2.91)
* Maternal home teach book print	28.69	(2.32)	24.86	(6.26)
CTC	47.00	(18.00)	49.00	(15.00)

*Note.* EP = environmental print, CTC = Children's Title Checklist, \*  $p < .05$



## Discussion

This study described the spontaneous use of environmental print by 35 mother-child dyads in an environmental print-rich play setting and examined the relationship between that behaviour and emergent literacy skills, print motivation, and self-report home literacy practices. To date, there has been little empirical evidence about how mothers and their children interact with environmental print letters and words how this relates to emergent literacy and home literacy practices. In addition, a close examination of what strategies mothers naturally use when referencing environmental print words and letters may inform the design of future home literacy interventions that centre on daily parent-child print interactions.

Mothers and children were observed to reference environmental print words and did so more frequently than they referenced letters. Mothers used a range of strategies when referencing environmental print in the play setting to scaffold their child's print learning. Maternal environmental print referencing was positively related to children's print concepts, letter and name writing, and maternal home literacy behaviours, in particular, story book reading. Children who referenced environmental print in the play setting had mothers who reported more frequent teaching of letters and words during book reading and there was a marginal trend for these children to be able to write more conventional letters. However, no relationship was found between mother and child environmental print referencing in the play setting and self-report of this behaviour at home.

### **Mother and Child Referencing of Environmental Print in the Play Setting**

Our observation of mothers and young children referencing environmental print is consistent with previous studies that have reported these types of parent-child

interactions (e.g., Harste et al., 1981; Lass, 1982; Mason, 1980; McGee & Richgels, 1989; Purcell-Gates, 1996). We extended these previous findings by exploring the extent that mothers and children point out letters embedded in environmental print words. We found that during the 15 minutes of play in the grocery shop setting, 69% percent of mothers and 37% of children referenced environmental print but most references were at the word level. Mothers and children rarely pointed out letters embedded in environmental print (11% of mothers and 8% of children). In the home setting, Purcell-Gates (1996) also observed a low frequency of letter referencing in environmental print compared to word referencing. In other studies focused on story book print, it has also been found that adults rarely reference letters or words to children during storybook reading (Ezell & Justice, 1998; Phillips & McNaughton, 1990) unless trained (Ezell & Justice, 2000; Justice & Ezell, 2000). Among those who did reference letters in our study, there was great variability in the frequency with which they did so. Purcell-Gates (1996) and Teale (1986) also found great variability in their low SES families, with numerous print interactions occurring in some families and hardly any in others.

The variability we found in mothers' frequency of environmental print referencing in the play setting could be due to maternal characteristics such as their education level or SES. This possibility was analyzed post hoc. No significant differences were found between mothers who did and did not reference environmental print on education level or SES. Another explanation may be that the frequency of environmental print referencing depends upon the type of mother-child activity around the environmental print; given that the present study was conducted in a play setting many mothers and children were quite focused on their grocery shop play. The effect of the context in which mother-child environmental print interactions occur could be

further examined in other environmental print-rich settings such as in a restaurant or post-office or the child's own home during various daily routines (e.g., meal times, tidying the house).

Microanalysis of environmental print referencing in the play setting revealed that some mothers used opportunities during play to intentionally teach their child about a letter embedded in an environmental print word. All letter interactions resulted in a response by the child and often involved the mother discussing the letter by identifying its name or sound through labelling or by directly asking the child these questions. These letter interactions sometimes involved the mother extending the child's knowledge of the letter by asking what other words or who else's name starts with that letter. These mothers also provided feedback and encouragement for their child's interactions with the letter. This suggests that direct referencing of letters embedded in environmental print during play could potentially help young children learn about letter shapes, names, and sounds.

However, most mothers in the present study (89%) did not naturally point out environmental print letters. Therefore, providing them with strategies to interact with letters in surrounding print could potentially improve the quality of their interactions. Referencing of letters in activities that spontaneously occur around meaningful and functional environmental print may provide an effective way to enhance alphabet knowledge (Gerard, 2004; Neumann et al., 2009; Neumann & Neumann, 2010). For example, one mother gained her child's attention by repeatedly tracing the dollar symbol (\$) on a grocery shop sign with her finger whilst saying its name and asking her child what the print said. Tracing elements of environmental print such as letters and numbers has also been reported in previous case studies (Neumann et al., 2009;

Neumann & Neumann, in press). Although speculative, this multisensory approach using tactile strategies may help children actively attend to and engage with letters, numbers, and symbols embedded in environmental print.

In contrast to the letter referencing interactions, maternal referencing of environmental print words in the play setting appeared to be less teaching oriented. Mothers were not observed to repeatedly point to the same word in order to teach it to their child like they did when referencing letters. They referred to the environmental print word to fulfil a play-based task then continued on with their play. A common task observed during the play was for mothers and children to find out the price of items so they could be paid. Therefore, mothers and children referred most frequently to the words on signs with prices. The cash register was a functional part of the grocery shop play and the majority of mothers and children spent time playing with it and exploring the printed labels on it as they scanned and paid for their groceries. The word “ACCEPT” was referenced as it popped up on the cash register when the credit card was scanned. These descriptions clearly illustrate that mothers and children interact with environmental print words in fun and meaningful ways but don’t use them in the same manner as letters to naturally scaffold their children’s learning.

Further microanalysis of the mothers’ environmental print word referencing interactions in the play setting showed that some children responded to their mother’s print referencing and others did not. The non-responding children appeared to ignore their mother’s referencing as they were busy doing something else (e.g., packing the shopping bag). The mother then followed their child’s lead in the next play interaction and the print interaction was generally brief without verbal exchange between mother and child. This suggests either that these mothers were being sensitive to their child’s

focus on the grocery shop play or that they were unable to engage or maintain their child's interest in the print. In contrast, the environmental print interactions where children were engaged and responsive to their mother's print referencing resulted in richer print interactions and discussions about the print. Providing mothers with effective environmental print referencing strategies (such as demonstrating, labelling, direction giving, extending learning, and providing positive feedback) that are designed to help maintain children's engagement with the print may be a valuable way to enhance young children's emergent literacy experiences.

### **Environmental Print Referencing and Emergent Literacy Skills**

Maternal referencing of environmental print in the play setting was associated with better print concepts in children. It is possible that maternal pointing out of words and letters embedded in environmental print may help children develop their knowledge about what a letter and word is and the left-to-right directionality of print. It is reasonable to suggest that the letter and word concepts component of the Concepts About Print test (Clay, 2005) would be more relevant to this relationship than the book handling skill items. The positive relationship between environmental print referencing and print concepts is consistent with Purcell-Gate's (1996) home environmental print study. She found that children who had more experience with print-embedded activities that involved direct instruction from literate others had more advanced print concepts. Justice and Ezell (2000) also found that training parents (26 mothers and 2 fathers) to use verbal (e.g., comments, questions, requests) and non-verbal references (tracking and pointing to words) during home story book reading resulted in a significant increase in children's print concepts. The current study extends this to show that maternal

referencing of environmental print is also associated with better print concepts in children.

Although little research has examined maternal environmental print referencing and early writing, the positive relationship found between the two measures in the present study is consistent with two case studies (Neumann et al., 2009; Neumann & Neumann, 2010). Those studies described how a mother's referencing of environmental print (e.g., on cereal box labels) fostered the child's letter and word writing. The current study provides quantitative evidence that greater maternal print referencing during play is associated with children having greater name and letter writing skills (word writing was not specifically tested due to the young age of the participants). Although speculative, it is possible that when mothers refer their child to environmental print words and letters during meaningful daily activities, children may learn to visually attend to the shapes of letters and individual letters in words that are personally meaningful to them. This, in turn, may help them remember how to write particular letters. In addition, they might actually use environmental print to copy letters and words during daily activities (e.g., writing a shopping list or greeting card). Baghban (1984) conducted a longitudinal case study of her daughter's reading and writing development from birth to 3 years and described how her parents referred her to surrounding environmental print from an early age and encouraged her in her early writing attempts. Baghban reported numerous instances at 2 years of age where her daughter spontaneously wrote letters from environmental print words she knew (e.g., the M from McDonald's).

In the present study, letter name and sound knowledge were not related to maternal environmental print referencing in the play setting. The fact that only a small

number of mothers actually referenced individual letters may explain this result. Justice and Ezell's (2000) parents were trained to use verbal and non-verbal references at the word level or sentence level during storybook reading and found that while this resulted in a significant increase in children's print concepts there was no effect on alphabet knowledge. This also may have occurred because parents were not explicitly focusing on individual letters. Therefore, it may be necessary to train mothers to point out letter names and sounds in print, either in the environment or in storybooks, to enhance children's letter knowledge.

Children's phonological awareness had not been investigated in previous environmental print studies. In the current study, it was also not related to maternal environmental print referencing in the play setting. This may be because the referencing of environmental print was mainly at the word level and mothers did not spend time focusing on phonological components (e.g., talking about words that rhymed with the environmental print word). Phonological awareness requires more explicit instruction (Adams, 1990). Thus, our findings suggest that maternal environmental print referencing may not be beneficial to developing phonological awareness skills such as initial and phoneme awareness and rhyme awareness in young children.

Children's print motivation was also not related to how frequently a mother referenced environmental print in the play setting. However, this null finding requires further investigation by testing children's print motivation following extended experience with and exposure to environmental print referencing to determine whether the meaningful and colourful nature of environmental print can enhance their interest in print related activities. Environmental print reading ability was also not associated with maternal referencing of environmental print. As already discussed, mothers referenced

print to children to achieve their goals in their play rather than focusing on teaching the environmental print words. Learning to recognize environmental print words is most likely dependent upon the length of time children are exposed to them and how explicitly the interaction focuses on teaching the word rather than referring to it for a functional purpose such as play. It is possible that maternal referencing of the same environmental print words over time during meaningful daily experiences could enhance their environmental print reading. Finally, very few children referenced environmental print themselves during the play. The lack of differences on emergent literacy skills between those who did and did not reference environmental print may have been due to this. Future controlled randomized studies comparing children's referencing of environmental print before and after an environmental print intervention program and the program's influence on emergent literacy would provide a clearer perspective on this.

### **Environmental Print Referencing and Home Literacy Practices**

Children who referenced environmental print in the play setting had mothers who self-reported more frequent pointing out of print during story book reading. This suggests that children's print referencing behaviours may be influenced by their mother's print referencing behaviours and could be transferred to interactions with other print types such as environmental print. It appears that children are able to model maternal print referencing in other contexts. It is also likely that maternal pointing to print in storybooks resulted in the child having more familiarity with certain letters and words, which, in turn, allowed them to recognize those letters and words when seen in environmental print. This suggests that if mothers were trained to point out letters in



environmental print during everyday encounters children would learn from this experience.

A positive relationship was found between home story book reading (maternal Child Title Checklist score) and maternal environmental print referencing in the play setting. Mothers who showed more engagement with story books at home were more likely to reference environmental print. Thus, environmental print referencing behaviours appears part of a wider engagement in literacy activities with the child. However, maternal referencing of environmental print in the play setting was not related to self-reported home maternal teaching of print or of referencing environmental print in the home. These self-report measures are much more open to socially desirable responding than the more objective Children's Title Checklist measure. Thus, when objective measures of the home literacy environment were used, there was a relationship to the observed environmental print referencing during play, but when self-report of literacy practices at home were used, there was no relationship to the observed behaviour in the play setting. Previous authors have questioned the validity of self-report questionnaires (e.g., Dodici et al., 2003; Vandermaas-Peeler et al., 2009). However, parent reports are thought to be a valid assessment tool because they are cost-effective and provide information that may be difficult for the researcher to observe (e.g., Boudreau, 2005). Conducting observational studies combined with tests designed to reduce the chance of social desirability responses (e.g. Children's Title Checklist) may enhance the validity of findings and provide a clearer picture of children's early literacy experiences. It is also possible that maternal environmental print referencing in the play setting was not related to self-reported teaching of print in the home environment because the observed behaviour reflected spontaneous play-based activity rather than a directed literacy teaching activity.

### **Limitations and Practical implications**

The mother-child dyads in this study were from mostly middle SES backgrounds and included only typically developing children. Therefore, these results might not generalize beyond this population. Future work with mothers and children from a wider range of developmental levels and SES backgrounds is needed to determine how other populations might use environmental print. The results are also limited to maternal and child behaviour in a play setting. Conducting observational studies in a range of environmental print-rich settings, for example, visiting the post office (e.g., signs on walls), shops (labels on toys), or in the home kitchen pantry (product labels) would provide further evidence of how parents and their children use environmental print during daily activities.

Environmental print is ubiquitous and a low cost literacy resource (e.g., food product labels) available across a range of SES levels and communities (Dickinson & Snow, 1987). With training, mothers with low literacy levels and who don't engage in regular storybook reading may feel more competent interacting with environmental print with its easily identified letters and words. Indeed, Neuman (1996) described that parents in their family literacy program who reported low literacy levels initially struggled with reading to their child. However, following training the parent's sense of efficacy and enjoyment increased and they were able to foster more effectively their child's and their own literacy skills. It might also be helpful to encourage mothers to point out letters more frequently during play-based activities in the home and extend these interactions and conversations by using questioning strategies (e.g., asking questions about the print on a toy label that is personally meaningful to the child; "Thomas the Tank engine is your favorite. Can you see a T for Thomas?"); as well as

strategies focused on the letter shape (e.g., encouraging the child to trace the letter with a finger) to consolidate learning.

### **Conclusion**

This present study observed mothers using a range of environmental print strategies such as demonstrating, labelling, direction giving, extending, and providing positive feedback to scaffold children's learning about letters and words. Mothers used spontaneous teachable moments during play to extend their child's exploration of letters and words in meaningful ways. However, not all mothers did this or were able to maintain their child's engagement in these print interactions. If mothers were trained to use the environmental print strategies observed in this study, some aspects of children's emergent literacy skills, such as print concepts and letter and name writing could be fostered. An empirically designed parent-child intervention program conducted in home and real-life settings would help determine the effects and possible long term benefits of environmental print referencing strategies in emergent literacy development.

### **Notes**

This article includes a word or words, logos, or brands, that is, or is asserted to be, a propriety term or trademark. All trademarks remain property of their respective holders, and are used only to directly describe the products. Inclusion does not imply it has acquired for legal purposes a non-propriety or general significance, nor is any other judgement implied concerning its legal status.

## References

- Australian Classification of Occupations, ASCO. In *Australian Bureau of Statistics* (2<sup>nd</sup> ed.). Retrieved from <http://www.abs.gov.au/AUSSTATS/abs>.
- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge: MIT press.
- Angus and Robertson Bookworld. (2006). Angus and Robertson's 100 all-time favourite children's books. <http://www.bookworld.com.au/kidstop1002.htm>
- Aram, D. (2002). Joint-writing in Hebrew of dictated words versus proper names: Analysis of low SES mother-kindergartner dyads. *Journal of Research in Childhood Education, 17*, 47-61.
- Aram, D., & Levin, I. (2001). Mother-child joint-writing in low SES sociocultural factors, maternal mediation, and emergent literacy. *Cognitive Development, 16*, 831-852.
- Baghban, M. (1984). *Our daughter learns to read and write: A case study from birth to three*. International Reading Association: Newark Delaware.
- Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology, 23*, 239-269.
- Bloodgood, J. W. (1999). What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly, 34*, 342-367.
- Bodrova, E., & Leong, D. J. (2007). *Tools of the mind: The Vygotskian approach to early childhood education*. Upper Saddle River, NJ: Prentice Hall.

- Bornstein, M. H., & Bradley, R. H. (Eds). (2003). Socioeconomic status, parenting and child development. Marwah, New Jersey: Lawrence Erlbaum Associates.
- Boudreau, D. (2005). Use of a parent questionnaire in emergent and early literacy assessment of preschool children. *Language, Speech & Hearing Services in Schools, 36*, 33-47.
- Bowey, J.A. (1994). Phonological sensitivity in novice readers and nonreaders. *Journal of Experimental Child Psychology, 58*, 135-159.
- Brassard, M. R., Boehm, A. E. (2007). *Preschool assessment: Principles and practices*. New York: Guildford Press.
- Clarke-Stewart, K. A., & Beck, R. J. (1999). Maternal scaffolding and children's narrative retelling of a movie story. *Early Childhood Research Quarterly, 14*, 409-434.
- Clay, M. M. (2005). *An observation survey of early literacy development*. Auckland: Heinemann.
- Clay, M. M. (2008). *Stones*. Rosedale, Northshore: Pearson.
- Cunningham, A. E., & Stanovich, K. E. (1993). Children's literacy environments and early word recognition subskills. *Reading and Writing: An Interdisciplinary Journal, 5*, 193– 204.
- De Vaus, D. (2004). *Analyzing social science data 50 key problems in data analysis*. Sage Publications: London.

- Dickinson, D. K., & Snow, C. E. (1987). Interrelationships among prereading and oral language skills in kindergarteners from two social classes. *Early Childhood Research Quarterly, 2*, 1-25.
- Dodici, B. J., Draper, D. C., & Peterson, C. A. (2003). Early parent-child interactions and early literacy development. *Topics in Early Childhood Special Education, 23*, 124-136.
- Dunn, L. M., & Dunn, D. M. (2007). *The Peabody Picture Vocabulary Test* (4<sup>th</sup> ed.). Bloomington, MN: NCS Pearson, Inc.
- Echols, L. D., West, R. F., Stanovich, K. E., & Zehr, K. S. (1996). Using children's literacy activities to predict growth in verbal cognitive skills: A longitudinal investigation. *Journal of Educational Psychology, 88*, 296 – 304.
- Ezell, H. K., & Justice, L. M. (1998). A pilot investigation of parent questions about print and pictures to preschoolers with language delay. *Child Language Teaching and Therapy, 14*, 273-278.
- Ezell, H. K., & Justice, L. M. (2000). Increasing the print focus of adult-child shared book reading through observational learning. *American Journal of Speech Language Pathology, 9*, 36-47.
- Gerard, M. (2004). What's a parent to do? : Phonics and other stuff. *Childhood Education, 80*, 159-160.
- Goodman, Y. (1986). Children coming to know literacy. In W. H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (pp. 1-14). Norward, NJ: Ablex.
- Hall, N. (1987). *The emergence of literacy*. London: Hodder & Stoughton.

- Harste, J. C., Burke, C. L. & Woodward, V. A. (1981). Examining our assumptions: A transactional view of literacy and learning. *Research in the teaching of English*, 18, 84-108.
- Hiebert, E. H. (1978). Preschool children's understanding of written language. *Child Development*, 49, 1231-1234.
- Hollingshead, A. B. (1975). *The four-factor index of social status*. New Haven, CT: Unpublished manuscript. Yale University.
- Hood, M., Conlon, E., & Andrews, G. (2008). Preschool home literacy practices and children's literacy development: A longitudinal analysis. *Journal of Educational Psychology*, 100, 252-271.
- Horner, S. L., (2005). Categories of environmental print: All logos are not created equal. *Early Childhood Education Journal*, 33, 113-119.
- Irwin, M and Bushnell, M.M. (1980). *Observational Strategies for Child Study*. New York Holt: Rinehart and Winston.
- Justice, L. M., & Ezell, H. K. (2000). Enhancing children's print and word awareness through home-based parent intervention. *American Journal of Speech-Language Pathology*, 9, 257-269.
- Justice, L. M., & Pullen, P. C. (2003). Promising interventions for promoting emergent literacy skills: Three evidence-based approaches. *Topics in Early Childhood Special Education*, 23, 99-113.
- Kuby, P., Aldridge, J., & Snyder, S. (1994). Developmental progression of environmental print recognition in kindergarten children. *Reading Psychology International Quarterly*, 15, 1-9.

- Lass, B. (1982). Portrait of my son as an early reader. *The Reading Teacher*, 36, 20-28.
- Lomax, R. G., & McGee, L. M. (1987). Young children's concepts about print and reading: Toward a model of word reading acquisition. *Reading Research Quarterly*, 22, 237-256.
- Mason, J. M. (1980). When do children begin to read: an exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly*, 15, 203-227.
- Masonheimer, P. E., Drum, P. A., & Ehri, L. C. (1984). Does environmental print identification lead children into word reading? *Journal of Reading Behaviour*, 16, 257-271.
- McGee, L. M., Lomax, R.G., & Head, M. H. (1988). Young children's written language knowledge: What environmental print and functional print reading reveals. *Journal of Reading Behaviour*, 20, 99-118.
- McGee, L. M. & Richgels, D. J. (1989). "K is Kristen's": Learning the alphabet from a child's perspective. *The Reading Teacher*, 43, 216-225.
- Muter, V., Hulme, C., Snowling, M., & Taylor, S. (1997). Segmentation, not rhyming, predicts early progress in learning to read. *Journal of Experimental Psychology*, 65, 370-396.
- Neuman, S. B., & Roskos, K. (1993). Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal*, 30, 95-122.



- Neuman, S. B. (1996). Children engaging in storybook reading: the influence of access to print resources, opportunity, and parental interaction. *Early Childhood Research Quarterly, 11*, 495-513.
- Neumann, M. M., Hood, M., & Neumann, D. L. (2009). The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal, 36*, 313-319.
- Neumann, M. M., & Neumann, D. L. (2010). Parental strategies to scaffold emergent writing skills in the preschool child within the home environment. *Early Years: An International Journal of Research and Development, 30*, 79-94.
- Neumann, M. M., & Neumann, D. L. (in press). The role of idiomorphs in emergent literacy. *Childhood Education*.
- Neumann, M. M., Hood, M., Ford, R. M., & Neumann, D. L. (in press). The role of environmental print in emergent literacy. *Journal of Early Childhood Literacy*.
- Otto, B. (2008). *Literacy development in early childhood: Reflective teaching for birth to age eight*. Upper Saddle River, NJ: Pearson Education.
- Phillips, G., & McNaughton, S. (1990). The practice of storybook reading to preschool children in mainstream New Zealand families. *Reading Research Quarterly, 25*, 196-212.
- Purcell-Gates, V. (1996). Stories, coupons, and the TV guide: Relationships between home literacy experiences and emergent literacy knowledge. *Reading Research Quarterly, 31*, 406-428.

- Rubin, L. H., Witkiewitz, K., St. Andre, J., & Reilly, S. (2007). Methods for handling missing data in the behavioural neurosciences: Don't throw the baby rat out with the bath water. *The Journal of Undergraduate Neuroscience Education*, 5, 71-77.
- Sinclair, A., & Golan, M. (2002). Emergent Literacy: A case-study of a two-year-old. *Early Child Development and Care*, 172, 555-572.
- Snow, C. E., Burns, S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Teale, W. H. (1986). Home background and young children's literacy development. In W.H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (pp. 173-206). Norwood, NJ: Ablex.
- Trawick-Smith, J., & Dziurgot, T. (2011). 'Good-fit' teacher-child play interactions and the subsequent autonomous play of preschool children. *Early Childhood Research Quarterly*, 26, 110-123.
- Vandermaas-Peeler, M., Nelson, J., Bumpass, C., & Sassine, B. (2009). Social contexts of development: Parent-child interactions during reading and play. *Journal of Early Childhood Literacy*, 9, 295-317.
- Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early Childhood Research Quarterly*, 9, 153-170.
- Vukelich, C., Christie, J., & Enz, B. (2008). *Helping young children learn language and literacy: Birth through kindergarten*. Boston, MA: Pearson.

Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*.

Cambridge, MA: Harvard University Press.

Welsch, J. G., Sullivan, A., & Justice, L. M. (2003). That's my letter! : What preschoolers' name writing representations tell us about emergent literacy knowledge. *Journal of Literacy Research, 35*, 757-776.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy.

*Child Development, 69*, 848-872.

Wood, D., Bruner, J. C., & Ross, G. (1976). The role of tutoring in problem solving.

*Journal of Child Psychology and Psychiatry, 17*, 89-100.

## Chapter 6 Prelude

### Mother-child Joint Writing in an Environmental Print Setting:

#### Relations with Emergent Literacy (Study 4)

Study 4 has been published in *Early Child Development and Care*. It builds on Study 2 that reported how a mother used environmental print to scaffold emergent writing. As little is known about environmental print and joint writing, Study 4 investigates the extent to which a larger group of mothers naturally use environmental print to scaffold their child's writing. Furthermore, it aimed to extend the joint writing research by Aram and colleagues (e.g., Aram & Levin 2001; 2002) working with Hebrew that differs somewhat to the English alphabetic script (e.g., Hebrew is written from right to left and consists of 22 letters with 5 changing when placed in a final position).

The mother-child dyads ( $N = 35$ ) who participated in the environmental print referencing study reported in Study 3 were also videotaped assisting their child to write a shopping list in that same environmental print rich grocery shop setting. Study 4 firstly determined if there was a relationship between the scaffolding that mothers provided for their child's writing and the child's emergent literacy skills (letter name and sound knowledge, print concepts, phonological awareness, and letter and name writing). Maternal scaffolding strategies to support writing were coded according to an established maternal print and grapho-phonemic mediation scale designed by Aram (2007; 2010). It was hypothesised that children of mothers who provided higher levels of maternal mediation would have more advanced emergent literacy skills. General maternal mediation strategies were found to be similar to prior joint writing research using Hebrew script (e.g., use of descriptive language and dictating letter names),

however, fewer relationships were found between maternal mediation and emergent literacy compared to these previous studies. This may have been due to the younger age and/or ability of the participants in the Study 4. Mothers also used multisensory strategies (e.g., tactile and kinaesthetic) such as tracing letter shapes on paper and forming letter shapes in the air to scaffold their child's writing, which were similar to those observed in Study 1 and 2.

The extent to which mothers naturally refer to surrounding and relevant environmental print to scaffold their child's writing was investigated. The environmental print strategies these mothers used included pointing out letters and words on product labels, encouraging copying of environmental print, and using directional and descriptive language to help in the shaping of letters. These were similar to those strategies observed in the Studies 1 and 2. However, as only a very small number of mothers actually used environmental print to scaffold their child's writing, the benefits of using environmental print to scaffold joint writing remains unclear.

The overall findings of this study showed that mothers using Hebrew and English alphabetic scripts utilise similar print and grapho-mediation strategies to scaffold their children's writing. However, the relationships between the level of mediation used and emergent literacy skills may be dependent on children's age and developmental abilities. Although environmental print was used by only a small number of mothers, the array of strategies observed highlight the need to further investigate its potential as a tool to support emergent writing development. In addition, the joint writing strategies observed helped inform the design of the writing activity that was incorporated into Study 5's intervention program.

**Statement of contribution to Chapter 6 co-authored published paper**

**Neumann, M. M., Hood, M., & Ford, R. (2011). Mother-child joint writing in an environmental print setting: relations with emergent literacy. *Early Child Development and Care*. DOI: 10.1080/03004430.2011.615928.**

This chapter includes a co-authored paper. The bibliographic details of the co-authored published paper, including all authors, are: Michelle. M. Neumann, Dr Michelle Hood, Dr Ruth Ford.

My contribution to the published paper involved the literature review, writing of the paper, data collection, and statistical analyses. The co-authors provided review of drafts and supervisory advice. Thank you to research assistant Rebecca Dale for her inter-rater assistance.

Name of Student: Michelle Neumann

(Signed)

Corresponding authors of published paper:

Name of Corresponding Authors:

(Countersigned) Dr Michelle Hood

(Countersigned) Dr Ruth Ford

(Countersigned) Dr Michelle Hood

Supervisor: Name of Supervisor

## **Chapter 6**

### **Mother-child Joint Writing in an Environmental Print Setting: Relations with Emergent Literacy**

Michelle M. Neumann, Michelle Hood & Ruth M. Ford

School of Applied Psychology, Griffith University, QLD, Australia

Please direct correspondence to:

Michelle Neumann: School of Psychology, Gold Coast Campus, Griffith University,  
QLD 4222, Australia. E-mail: [michelle.neumann@griffithuni.edu.au](mailto:michelle.neumann@griffithuni.edu.au)

Facsimile: +61(0)7 5552 8291, Telephone: +61(0)7 5552 8052.

### Abstract

Mother-child dyads ( $N = 35$ ) were videoed as they wrote a shopping list in an environmental print-rich grocery shop play setting. The children ( $M$  age = 4.3 years) were assessed on emergent literacy skills (letter name and sound knowledge, print concepts, phonological awareness, and letter and name writing). Mothers' general level of print and grapho-phonemic mediation during the joint writing task was scored. After controlling for child age, maternal print and grapho-phonemic mediation of children's writing were both positively related to letter-sound knowledge. Grapho-phonemic mediation was positively related to print concepts. A particular focus of this study was to investigate mothers' natural use of surrounding environmental print to scaffold writing. Only 4 mothers used environmental print to scaffold their child's writing. These mothers applied a variety of strategies including pointing out letters, describing letter shapes, and encouraging copying of letters and words from product labels and signs. There were no obvious differences between those who did or did not use environmental print in demographic factors, emergent literacy skills, or maternal mediation during joint writing. Despite there being only a small number of mothers who used environmental print, the range of strategies observed highlights the need for further research into using environmental print to scaffold children's emergent writing.

*Keywords:* environmental print, joint writing, emergent literacy, mother-child interactions, preschoolers



## **Mother-child Joint Writing in an Environmental Print Setting: Relations with Emergent Literacy**

Environmental print surrounds us daily and fulfils real-life functions (e.g., product labels and signs; Horner, 2005; Prior & Gerard, 2004; Vukelich, Christie & Enz, 2008). There is some evidence that it plays an important role in emergent literacy, especially in the home (Gerard, 2004; Miller, 1995; for a review see Neumann, Hood, Ford, & Neumann, in press) as children explore and use it to gain meaning (Goodman, 1986; Harste, Burke, & Woodward, 1981; Whitehurst & Lonigan, 1998). Logographic reading (using visual cues rather than letter-sound analysis to decode words; Frith, 1985) of environmental print is also positively associated with emergent literacy skills such as print concepts, phoneme awareness, and alphabet knowledge (Lomax & McGee, 1987; McGee, Lomax, & Head, 1988). These emergent literacy skills are important predictors of future reading ability and long-term academic outcomes (e.g., Australian Government, 2005; Snow, Burns, & Griffin, 1998).

Observational reports of parent-child interactions with environmental print have emphasized the important role that parents play in using this type of print to scaffold emergent literacy (Baghban, 1984; Campbell, 1998; Lass, 1982; Mason, 1980; McGee & Richgels, 1989; Miller, 1995; Neumann, Hood, & Neumann, 2009; Neumann & Neumann, 2010; Purcell-Gates, 1996; Sinclair & Golan, 2002). The term *scaffolding* (Wood, Bruner, & Ross, 1976) refers to a parent's ability to sensitively provide their child with enough guidance to extend the child's movement within their zone of proximal development (Vygotsky, 1978). For example, Lass (1982) described how she pointed out and said the names of letters on street signs to her young son during their walks together after which he would identify them. McGee and Richgels (1989) reported how a father pointed out the K in *K-mart*. His daughter responded by saying, "I

see a K, just like Kristen” (p. 221). Similarly, Neumann et al. (2009) described how a mother pointed out and traced letters on cereal box labels at breakfast time with her son. Parents are in an ideal position to draw their children’s attention to environmental print that is attuned to their socio-cultural background, and respond to their child in ways that can support and extend their reading of environmental print (Gerard, 2004; Miller, 1995).

However, little is known about environmental print and emergent writing. Two case studies have examined parental use of environmental print to scaffold children’s early writing (Neumann et al., 2009; Neumann & Neumann, 2010). Neumann and Neumann (2010) reported how a mother pointed out environmental print to her child, saying the letter name and sound, traced these letter shapes with fingers, wrote letter shapes in the air with hands and used directional (up, down, around, and across) and descriptive language (e.g., “That’s a snakey SSSS” p. 82) to scaffold the writing of these letter shapes and words on paper. “Roseanna” responded positively to this approach by initiating her own writing using these strategies.

It is well established that a child’s early writing experiences are important in early literacy development (e.g., Diamond, Gerde, & Powell, 2008; Mayer, 2007; Ritchey, 2008; Stellakis & Kondyli, 2004; Sulzby, Barnhart, & Hieshima, 1989; Teale & Sulzby, 1986). Across cultures, children’s earliest scribbles or markings purposely convey meaning and contain universal features such as linearity and wavy lines (Levin & Bus, 2003; Tolchinsky, 2003; Yamagata, 2007). However, learning to write requires an emerging understanding of symbolic representation and writing conventions that are specific to a child’s language system (e.g., Puranik & Lonigan, 2011). Baghban (2007) described the approximate timetable for early writing development specific to English

alphabetic script. From 1 to 3 years children engage in random or localized scribbling. Between 1 ½ and 3 years they show controlled scribbling (e.g., dots, circles). They can write their own name between 4 and 6 years, at which point they also show linear expansions/labelling or captioning of drawings as well as pre-phonetic spelling (with no correspondence to sounds). Phonetic spelling (use of alphabetic consonant and vowel sounds) emerges between 4 and 7 years.

Emergent writing skills such as letter, name, and word writing are related to emergent literacy skills including alphabet knowledge (Bloodgood, 1999; Diamond et al., 2008; Hecht & Close, 2002; Molfese, Beswick, Molnar & Jacobi-Vessels et al., 2006; Ritchey, 2008; Welsch, Sullivan, & Justice, 2003) and phonological awareness (Aram, 2006; Aram & Biron, 2004; Aram & Levin, 2001). The valuable role that parents play in supporting and shaping their children's early writing attempts by providing writing materials and opportunities to use them, giving feedback about writing attempts, and extending and clarifying writing interactions through sensitive mediation are well-established in preschool-aged children (Aram, 2002, 2007, 2010; Aram & Levin, 2001, 2002; Burns & Casbergue, 1992; DeBaryshe, Buell, & Binder, 1996; Green, 1987; Stellakis & Kondyli, 2004; Yang & Noel, 2006).

For example, Baghban (1984) describes a longitudinal case study of her child 'Giti' from birth to 3 years of age during which time her emergent scribbles, drawing, and writing were encouraged and scaffolded by her mother. Bloodgood (1999) observed a parent of a 2-year-old guiding his name writing attempts by providing an example and holding his hand to trace. Pinto, Accorti Gamannossi, and Cameron (2011) observed joint drawing interactions in seven 30-month-old children and their families in seven countries (Thailand, Peru, Italy, Canada, UK, USA, and Turkey). They found that

across cultures children's early drawing interactions consisted of similar features such as shared adult-child attention and presence of drawing materials in homes. Pinto et al. also described how parents use playful drawing interactions to teach their children about print. For example, they describe how a Turkish father drew a BMW logo and then asked his daughters, "What is this?" His daughters whispered back the names of the letters to him. Other studies that have focused more on specific joint writing tasks (e.g., writing a letter; Burns & Casbergue, 1992) have shown parents modelling words for their child to copy and dictating letter names in a warm and affectionate way (Aram & Levin, 2001).

The benefits of mother-child joint writing in enhancing emergent literacy skill development and predicting long-term benefits to conventional literacy skills has been shown in a number of studies by Aram and colleagues. For example, Aram and Levin (2001; 2002) examined mothers' scaffolding strategies (e.g., word segmenting, retrieval of letter shapes, and printing) during joint writing activities with their kindergarten children and found that mediation in joint writing activities was strongly linked to word writing and recognition and phonological awareness. Aram and Levin (2004) followed up these participants 2 ½ years later and evaluated their spelling, reading comprehension, and linguistic skills in Grade 2. The quality of maternal writing mediation in kindergarten predicted these literacy measures, after controlling for differences in SES. This highlights the significance of early joint writing experiences in emergent literacy development.

In a recent intervention study, Levin and Aram (2010) coached mothers to mediate their child's learning of writing (using a commercial kit of magnetic letter/word games for enhancing letter knowledge and writing words that start with a specific letter sound),

storybook reading (using open-ended questions during shared reading), or visuomotor skills (cutting and gluing activities), and assessed the effects on emergent literacy. Maternal mediation of writing was the most effective in promoting alphabet knowledge (letter name and sound), phonological awareness, word spelling, and decoding. Levin and Aram further suggested that joint writing activities could be made more fun and enjoyable for parents and children by encouraging them to engage in a range of home-writing activities such as writing friends' names on birthday invitations, a note to grandparents, or a grocery list.

To our knowledge, no studies beyond case studies (e.g., Baghban, 1984; Neumann, et al., 2009; Neumann & Neumann, 2010) have investigated to what extent mothers naturally utilize surrounding environmental print to scaffold children's early writing. Environmental print is meaningful and functional and could be used in everyday joint-writing activities like writing shopping lists. Furthermore, the relationship between maternal print mediation using environmental print and emergent literacy skills has not been investigated in a larger sample. Another current limitation, is that most of the joint-writing studies come from one group (Aram and colleagues) working with Hebrew script, which differs to the English alphabetic script. For example, Hebrew is written from right to left and consists of 22 letters with 5 changing form when placed at the end of a word. English is written from left to right, and consists of 26 letters. Therefore, further research is needed to determine if the maternal strategies already noted generalize to the English alphabetic script.

To explore this, the present study used observational methods within a grocery shop play setting to examine how mothers initiate a strategy of using salient environmental print to scaffold their child's writing in a joint writing activity (i.e.,

writing a shopping list). Environmental print settings provide a social context where literacy behaviours naturally occur and have been designed and used by researchers to replicate literacy contexts from the outside world (Neuman & Roskos, 1993; Vukelich, 1994). An advantage of the observational method is that it provides realistic data on how mother-child dyads naturally interact with environmental print when completing a joint writing task as opposed to parent questionnaires which are subject to social desirability bias (Dodici, Draper, & Peterson, 2003).

More broadly, this study examined the general types of joint writing strategies mothers used. It also investigated the relationship between maternal print mediation (maternal scaffolding of written letter formation; Aram, 2002) and grapho-phonemic mediation (maternal scaffolding of letter-sound connections during word writing; Aram, 2002) and children's emergent literacy skills. It was expected that maternal print and grapho-phonemic mediation during the joint writing task would be positively associated with emergent literacy skills. As the extent to which mothers would naturally use environmental print was unknown, no specific predictions regarding this were made. Finally, this study examined maternal print mediation in a sample of native English-speaking Australian mother-child dyads. This allowed previous results obtained with Hebrew (e.g., Aram & Levin, 2001; 2002) to be extended to English writing.

## **Method**

### **Participants**

The sample comprised 35 mother-child dyads recruited from six childcare centres on the Gold Coast in Queensland, Australia. The preschool children (43% boys; 57% girls) had a mean age of 4.3 years ( $SD = .47$ ; range = 3.36 – 4.98 years). Children who had known developmental problems or for whom English was not their main

language (reported by parents on a parent demographic questionnaire) were excluded. Children were also excluded if they had a standard score below 80 on the Peabody Picture Vocabulary Test 4<sup>th</sup> Edition (PPVT-IV, Dunn & Dunn, 2007) to ensure average language development. Three children for whom consent was obtained were excluded based on these criteria.

Most mothers were married or in a de facto relationship (91.4%), 2.9 % were divorced or separated, and 5.7 % were never married or in a de facto relationship. The percentage of mothers in each education level were 10<sup>th</sup> or 11<sup>th</sup> grade (5.8%), high school graduate (14.3%), partial college or specialized training (25.7%), standard college or university degree (37.1%), and graduate professional training (17.1%). The family socio-economic status (SES) was calculated using the Hollingshead 4-factor Index (Hollingshead, 1975). The mean fell in the middle SES range from 40 to 54 ( $M = 51.26$ ;  $SD = 8.18$ ; Range 34 - 63). Most children (23) were first-born, nine were second-born, two third-born, and one child was fifth-born. Most children (21) had one sibling, eight had no siblings, five had two siblings, and one child had four siblings. Most children lived with both parents (77.1%) and one child lived with only their mother. The remainder (7) lived with three or four adults in their family.

## **Procedure**

Ethics approval was obtained from the university research ethics committee. Permission was gained from the directors of the six childcare centres and written informed consent to participate was obtained from mothers. Eligible children were assessed in a quiet room at their centres on the emergent literacy measures (letter name and sound knowledge, print concepts, phonological awareness, name and letter writing). Children were thanked with stickers at the completion of the assessments. On the same

day, each mother and child dyad completed the joint writing task (a shopping list) in a grocery shop play setting.

### **Joint writing task**

Mothers and children played for 15 minutes in a grocery shop setting in which they were able to handle the environmental print items immediately prior to the joint writing task. The play in the grocery shop setting that occurred prior to the writing task enabled mothers and children to gain exposure to the print and become familiar with the setting. Mothers were instructed to “Please play naturally with your child for 15 minutes in this grocery shop play setting”. For the joint writing task, each mother-child dyad was asked to sit side-by-side at the table in the grocery shop setting. Mothers were then instructed “Now we will do something different. I want you to help your child write some words so you are going to help your child write a shopping list. I want your child to do the writing but you can help in any way you like. The first word I want you to help your child to write is lollipop. The next word I want you to help your child write is icecream. Please help your child write more words on your shopping list if you have time. I’ll give you five minutes to write.” A blank sheet of A4 paper and one pencil was placed on the table in front of the child. As noted earlier, mothers and children were not prompted in any way to use the environmental print items on the surrounding shelves as we were interested in the extent to which this would occur spontaneously. The researcher remained in the room to video the joint writing task and sat behind the video recorder.

### **Materials**

A small corner of a room was fitted with grocery shop props (e.g., cash register), grocery items (e.g., cereal boxes, icecream box, lollipop packet), and signs (e.g., EXIT,



GROCERY SHOP, OPEN/CLOSED), as well as a small table and chairs for the joint writing activity.

## **Measures**

### **Joint writing**

Maternal behaviours during the joint writing task were coded using an established scale adapted from Aram (2002, 2007, 2010) and Aram and Levin (2001, 2002) for maternal print mediation (maternal scaffolding of letter shaping; see Table 1) and grapho-phonemic mediation (maternal scaffolding of letter-sound connections; see Table 2). Maternal print mediation was scored on a scale of 0 to 4 (see Table 1) for each letter in the given words (lollipop and icecream) written by the child. An average score was computed across the number of letters the child had written. Each letter produced in each word was also scored on a scale of 0 to 7 for grapho-phonemic mediation (Table 2) and an average score computed. In addition, as pointed out by Aram (2007, 2010) the highest level of the mediation scales (print mediation: mother encourages the child to form the letter on their own, and grapho-phonemic mediation: mother encourages the child to write the correct letter on their own) reflects active monitoring and guidance by the mother that enables the child to print letters and encode words independently.

Scoring of environmental print use refers to any use during the joint writing task. Mothers scored 1 point for using environmental print in the grocery shop setting to scaffold writing (no use, score = 0). The environmental print strategies used by mothers were transcribed and described qualitatively.

Table 1

*Print Mediation Scale (Maternal Scaffolding of Letter Shaping)*

Behaviour	Point scale
Mother allows child to scribble randomly or write their own letters.	0
Mother holds/guides the child's hand to shape the letter or helps the child trace letters by doing dots in shape of letter.	1
Mother writes a letter then the child copies it.	2
Mother scaffolds the child's letter shaping verbally as the child writes the letter (e.g., "M goes up, down, up, down"; "H has 2 sticks in it"; "it's just like in your name", mother traces letter on the page with a finger, or mother writes it in the air).	3
Child shapes the letter correctly on his/her own with the mother's encouragement.	4

Table 2

*Grapho-phonemic Mediation Scale (Maternal Scaffolding of Letter Sound Connections)*

Maternal Behaviour	Point scale
Mother allows the child to scribble randomly or write their own letters.	0
Mother holds/guides the child's hand to write the letter (silently and does not say letter name) or does dots for child to trace letter.	1
Mother writes the letter for the child to copy (mother writes the word silently and child copies below).	2
Mother dictates the letter name as the child writes it.	3
Mother retrieves a phonological unit (phoneme/letter sound) then immediately dictates the required letter name then the child writes it down.	4
Mother retrieves a phonological unit (phoneme/letter sound) and encourages/helps the child link the phoneme with the letter name (child may or may not give the wrong answer first then with help says the correct letter name).	5
Mother encourages the child to retrieve a phonological unit (phoneme/letter sound) and helps the child link it to the letter name but does not provide letter sound or name. (e.g., M: "what do you hear next? Listen carefully to the sound". C: L (child says letter sound). M: "How do we write it?" C: L (child says letter name). Then child writes it down.	6
Child retrieves and writes the correct letter sound/name on his/her own with mother's encouragement.	7

The first author initially scored all of the 35 joint-writing sessions. Then inter-rater reliability between two judges (the first author and a trained research assistant) was computed on the scoring of the print and grapho-phonemic maternal mediation of each of the written letters from a random selection of 28% of the sample ( $n = 10$ ; 5 boys and 5 girls; this equal gender split occurred by chance). This selection is comparable to other joint writing studies that have randomly selected 20% of their sample for inter-rater reliability (Aram, 2002; Aram & Levin, 2002). Inter-rater reliability for maternal print mediation and maternal grapho-phonemic mediation was .96 and .98, respectively. Following discussion and agreement on the inter-rater scores, and because the scores were similar, the first author's were used.

**Letter name and sound knowledge.** Children were presented with 26 upper-case letters printed in black Century Gothic font size 72 on individual 8 x 8 cm white cards. These were presented in random order. Children were asked to name the letter and provide its sound. A score of one point was given for each correct answer (max = 26 each for letter name and sound knowledge).

**Print concepts.** Clay's Concepts about Print test (2005) was administered by reading a storybook (Stones; Clay, 2008) to the child while asking questions about print concepts (e.g., point to where to start reading, point to a little letter). Children scored 1 point for each correct response and these were summed for a total print concepts score. There are acceptable split half reliabilities (0.84 - 0.89) and validity (0.64 - 0.79; Brassard & Boehm, 2007). In the current study, only 9 of the 20 questions used showed acceptable internal consistency (Cronbach's  $\alpha = .71$ ), so only these 9 were retained in the final total score (max = 9).

**Phonological awareness.** Phonological awareness was assessed using three tests. In the rhyme detection test (based on Muter, Hulme, Snowling, & Taylor, 1997), four words (one target and three others) were presented in picture form while the examiner named them. The child was asked to point to one of the three pictures (e.g., car, table, bear) that rhymed with or sounded like the target picture (e.g., chair). There were 10 trials and children scored 1 for each correct response (max = 10). Two practice items were provided with corrective feedback on these trials only.

The initial and final phoneme detection tests (based on Bowey, 1994) used similar methodology. Four words (1 target and 3 choices) were presented in picture form while the examiner named them. Children were asked to pick the word that started with the same sound as the target word (initial phoneme; e.g., bed and brush) or ended with the same sound (final phoneme; e.g., leg and pig). There were 2 practice trials for each test that included corrective feedback followed by 10 trials (max = 10). A total score for phonological awareness out of 30 was obtained by combining the rhyme and initial and final phoneme scores. Cronbach's  $\alpha$  was .75, indicating acceptable internal reliability. The phonological awareness scores were not adjusted for guessing.

**Writing.** Each child was asked to write their name first then all the letters they knew and could generate on their own in 60 seconds. Name writing was scored using a 7-point scale adapted from Bloodgood (1999) and Welsch et al. (2003; 0 = No production e.g., child refuses to write; 1 = Random scribbling; 2 = Controlled and/or linear scribbling with no discernible letters present; 3 = Random letter-like forms; 4 = Strings of conventionally written random letters in linear patterns or the first letter of their name; 5 = Name writing consisting of some correct letters; 6 = Name writing is

generally correct and some letters may be written backwards; 7 = Name written and spelled correctly).

For letter writing, each correctly written letter was given one point (upper and lower case of the same letter were given one point each but repeated letters were counted once only). Controlled and/or linear scribbling such as drawings, dots, circles, lines with no discernible letters present and random letter-like forms oriented incorrectly or back to front (i.e., pseudo-letters) were scored as zero. The number of conventional letters written was tallied to give a total letter writing score.

**Receptive vocabulary.** The PPVT-IV (Dunn & Dunn, 2007) measures receptive vocabulary. The child selects one of four pictures that best represents a word spoken by the examiner. Dunn and Dunn reported split-half reliabilities of around .94.

## Results

### General Maternal Print Mediation Strategies

Table 3 presents the percentages of mothers who engaged in each print mediation behaviour to scaffold the child's writing of lollipop and icecream. Very few mothers allowed their child to randomly scribble. The most commonly observed behaviour was the mothers using verbal and interactive scaffolding strategies (42.9%). Nearly half of the mothers engaged in this. Approximately one third of mothers wrote letters for their child to copy. A small percentage of mothers made dots in the shape of the letter on the page for their child to trace over or held the child's hand/wrist to guide the child's formation of more difficult letter shapes. Very few children independently formed letters.

A wide range of verbal strategies that used descriptive or directional language to scaffold letter shaping were observed in 15 mothers. Descriptions were personally relevant to the child and linked the letter shape to the shape of common objects; for example, “P looks like a lollipop”; “m is like two bridges or two mountains”. Other maternal descriptions focused on letter shapes; for example, “a is like a circle with a stick”, “c is a half a circle; “i is a line with a dot”. Other descriptions referred to a letter as a combination of shape and other letter or number names; for example, “P has a big long line like a 1, and a half a circle on top”; “O is a zero”, “y is a u with a tail”. Mothers also referred the child to a personal word they already knew that contained the target letter. Generally, the reference was to their own or to other children’s names; for example, “E like in your friend Eva” or “c like in Jack”.

Directional language (up, down, around, and across) also helped children shape letters. For example, “c goes around and stops”; “e goes across and around”, “l goes down” and ‘M goes up and down”. One mother said, “p goes up and a little bit around” as she drew it in the air with her finger. Of the 15 mothers, 13 used a combination of descriptive and directional language for example, “e goes in the middle and around with a tail”; “P goes down with a circle attached”.

Table 3

*Percent of Mothers Engaging in each Print Mediation Behaviour*

Behaviour	Percent
Mother allows child to scribble randomly or write their own letters.	11.4%
Mother holds/guides the child's hand to shape the letter or helps the child trace letters by doing dots in shape of letter.	8.6%
Mother writes a letter then the child copies it.	28.6%
Mother scaffolds the child's letter shaping verbally as the child writes the letter (e.g., "M goes up, down, up, down"; "H has 2 sticks in it"; "it's just like in your name", mother traces letter on the page with a finger, or mother writes it in the air).	42.9%
Child shapes the letter correctly on his/her own with the mother's encouragement.	8.5%

**General Maternal Grapho-phonemic Mediation Strategies**

Table 4 presents the percentages of mothers who engaged in each grapho-phonemic mediation behaviour. Again, very few mothers allowed their child to scribble randomly or write letters unrelated to the target words. The most commonly observed behaviour, seen in around two thirds of mothers (68%) was the mother dictating the letter names for the child to write the word. There was little use of phonological strategies. A small percentage of mothers retrieved a phoneme/letter sound but immediately dictated the required letter name. No mothers were observed encouraging the child to utilize the phonological representation independently in order to write the grapheme.

Letter names were often associated with a word or name that was personally meaningful to the child. Some mothers would also emphasize the initial letter sound in the associated word (e.g., "like M for MMMadison"). Other mothers said the letter

name then linked it with a word beginning with the same letter sound such as p for puppy, o for octopus; r for rabbit. This was extended by the mother asking their child what else began with that letter. For example, one mother said, “e for Ethan, what other words start with e?” The child replied, “Elisha”.

Interestingly, two mothers encouraged their child to write the next letters in the words and praised their child even though the letters were incorrect. For example, a mother prompted her daughter to complete the word icecream and said “Icecream, what can you hear at the end?” The child replied “buh” and the mother said, “OK write it down”. The child wrote the letter b, and the mother said, “Beautiful”. Then she ran her finger under each of her child’s words, saying “lollipop” and “icecream”, even though the child’s words did not resemble those words. Another mother allowed her daughter to write whatever letters she wished for each word. Although the child was shaping letters conventionally, they were strings of recurring random letters with no association to the required word. The mother praised the child after she wrote each of her “words”. These mothers appeared to display sensitivity to their child’s writing attempts and encouraged them; however, they did not extend their child’s grapho-phonemic knowledge during these interactions.



Table 4

*Percent of Mothers Engaging in each Grapho-phonemic Mediation Behaviour*

Maternal Behaviour	Percent
Mother allows the child to scribble randomly or write their own letters.	5.7%
Mother holds/guides the child's hand to write the letter (silently and does not say letter name) or does dots for child to trace letter.	11.4%
Mother writes the letter for the child to copy (mother writes the word silently and child copies below).	5.7%
Mother dictates the letter name as the child writes it.	68.6%
Mother retrieves a phonological unit (phoneme/letter sound) then immediately dictates the required letter name then the child writes it down.	8.6%
Mother retrieves a phonological unit (phoneme/letter sound) and encourages/helps the child link the phoneme with the letter name (child may or may not give the wrong answer first then with help says the correct letter name).	0%
Mother encourages the child to retrieve a phonological unit (phoneme/letter sound) and helps the child link it to the letter name but does not provide letter sound or name. (e.g., M: "what do you hear next? Listen carefully to the sound". C: <i>L</i> (child says letter sound). M: "How do we write it?" C: <i>L</i> (child says letter name). Then child writes it down.	0%
Child retrieves and writes the correct letter sound/name on his/her own with mother's encouragement.	0%

**Relationships Between Joint Writing Mediation and Emergent Literacy**

Letter name knowledge, print concepts, phonological awareness, name writing, maternal print and grapho-phonemic mediation were all normally distributed. Letter sound knowledge and letter writing were both positively skewed. Square-root transformations resulted in normal distributions. The descriptive statistics are shown in Table 5. The mean maternal print mediation score approximates to verbal scaffolding of the letter shape (e.g., L goes down and across). The mean maternal grapho-phonemic score approximates to mothers dictating letter names as the child wrote each letter. The

maximum score achieved in grapho-phonemic mediation indicates that mothers were generally mechanically assisting their child to write rather than encouraging their child to retrieve letter sounds. More letter names than sounds were known; however, there was a wide range in children's letter knowledge. While some children knew all the letter names, no child knew all 26 letter sounds. There was also much variability in children's phonological awareness, with all children showing some awareness of the phonological units assessed. On average, the children had some knowledge of print concepts (e.g., book handling, directionality, and letter and word concepts such as what a capital letter is). However, again there was wide variability with some children not showing any of these concepts and some at ceiling. On average, the children could independently write between three and four letters and some letters in their name, especially the first letter. The mean receptive vocabulary (screening measure) score was within the "Average" range, with a range from "Low Average" to "Superior".

Table 5

*Descriptive Statistics for Maternal Mediation and Child Emergent Literacy Skills*

Measure	Mean	SD	Range
Print mediation (max = 4)	2.75	1.13	0-4
Grapho-phonemic mediation (max = 7)	2.89	1.01	0-4.88
Letter name (max = 26)	11.40	9.40	0-26
Letter sound (max = 26)	3.49	5.07	0-22
Print concepts (max = 9)	3.66	1.94	0-9
Phonological awareness (max = 30)	12.03	5.02	5-23
Name writing (max = 7)	4.71	2.23	1-7
Letter writing	3.65	4.35	0-15
Receptive vocabulary (standardized score)	106.51	10.30	84-130

Bivariate correlation analysis was used to explore the relationships between maternal print and grapho-phonemic mediation in the environmental print setting and emergent literacy skills. A 1-tailed test of significance was used because it was expected that mothers who provided higher levels of mediation during joint writing would have children with higher emergent literacy skills. Preliminary analysis showed that age was significantly correlated with all emergent literacy measures so the variance it explained was partialled out of subsequent analyses.

Table 6 presents the partial bivariate correlations between maternal print mediation and emergent literacy skills, with age controlled. There was a strong correlation between maternal print mediation and grapho-phonemic mediation, with 44.89% of the variance overlapping between these two measures. Each of these was significantly positively associated with letter-sound knowledge, accounting for around 10% of the variance in that aspect of emergent literacy. Therefore, a higher level of scaffolding during the joint-writing task was associated with greater child letter-sound knowledge. Only grapho-phonemic mediation was significantly positively correlated with print concepts, accounting for 9% of that variance. In contrast, maternal print and grapho-phonemic mediation were not significantly related to letter name knowledge, phonological awareness, or child letter and name writing.

Table 6

*Partial Correlations Between Maternal Print and Grapho-phonemic Mediation and Emergent Literacy Skills, Controlling for Age.*

Variable	1	2	3	4	5	6	7	8
1. Letter Name	—							
2. Letter Sound <sup>a</sup>	.52**	—						
3. Print Concepts	-.04	.15	—					
4. Phonological Awareness	.17	.58**	-.09	—				
5. Name Writing	.23	.14	.15	-.03	—			
6. Letter Writing <sup>a</sup>	.15	.08	.05	-.05	.72**	—		
7. Maternal Print Mediation	.19	.29*	.21	.17	.08	.13	—	
8. Maternal Grapho-phonemic Mediation	.02	.34*	.30*	.16	.05	.18	.67**	—

*Note.* 1-tailed \* $p < .05$ ; \*\* $p < .01$ , <sup>a</sup> Square root transformed

### **Maternal Use of Environmental Print to Scaffold Writing**

Only four mothers (11.4%) spontaneously used environmental print to scaffold their child's writing of letters and words. These mothers used environmental print to help their child identify and copy letters and words. This was observed to engage their children's interest and to provide rich opportunities for mother-child interactions about print during the joint writing task. The mother-child interactions that used environmental print are described below, with corresponding writing samples provided in Figure 1. In Figures 1a and 1b the 3-year-old children required mechanical assistance for printing letters (e.g., drawing dots for the child to trace or holding their hand to shape a letter) and these mothers did not use phonemes to mediate writing. In Figure 1c the mother scaffolded the child's letter shaping verbally (e.g., "you have to draw a stick

and a circle at the top”) and dictated the letter names. In Figure 1d the child was able to shape her letters correctly with her mother’s encouragement and the highest level of grapho-phonemic mediation observed was maternal dictation of letter names.

***Mother and son aged 3.43 years*** (see Figure 1a)

[The mother retrieved the lollipop packet from the grocery shop shelf and pointed to the word lollipop on the packaging to her child]

Mother: “What’s that?” [The child looked at the label]

Child: “Lollipop”.

[The mother pointed to the word lollipop again and the child looked at it]

Mother: “What if we write a shopping list and we’ll put lollipop on our shopping list?”

[The mother placed the lollipop packet back on the grocery shop shelf.

Then the child wanted to draw a picture of a lollipop. The mother retrieved the packet again and they looked at the picture of it on the packet]

Mother: “It’s a circle shape”

Child: “It has a stick”.

[The child drew pictures of lollipops. The mother pointed to the word lollipop on the packaging again]

Mother: “Look can you see that word there, it says lollipop. Do you want to try and write it? I’ll do some dots and you can trace them”.

[The child did not trace over the mother’s dotted letters].

[The mother asked the child to draw an icecream and then she retrieved the icecream product from the shelf].

Mother: “What does the icecream look like in this picture?”

Child: “It looks like a hot air balloon”.

[The mother pointed to the word icecream on the label]

Mother: “Do you know what that says there?” [The child looked at the label].

Mother: “Ice”.

Child: “Ice”. [The mother pointed to the next word]

Mother: “Do you know what that word says there?”

Child: “Icecream”.

Mother: “You are so clever”.

[The mother made dots for the word icecream for the child to trace. The child traced over the dotted letters i,c,e with his pencil, but then scribbled over it].

***Mother and son aged 3.91 years*** (see Figure 1b):

[The mother pointed to the icecream product]

Mother: “Do we need some icecream then?”

[The mother pointed to the letters on the icecream lid]

Mother: “Can you copy these letters for me?”

[The mother pointed to the letters on the lid again]

Mother: “See those letters there?”

Child: “Yes”.

Mother: “Can you copy that?”

Child: “No”.

[The mother pointed to the letters again]

Mother: “Can you write icecream, we need some of these letters”.

[The mother pointed to the I on the icecream lid]

Mother: “I, like this one”.

[The child looked at the ‘I’ on the lid]

Child: “I”.

[The child began to copy the letter I].

Mother: “straight down”. (As the child wrote the ‘I’)

[The child pointed to the C with his finger then copied it by himself. The mother pointed to the E].

Mother: “We need an E so we know its ice”.

Child: “I don’t know how to draw that one”.

Mother: “OK well you hold the pencil and I’ll show you”.

[The mother then helped the child write rest of letters c, r, e, a, m without referring to the environmental print by holding his hand to form the letters; and while the mother said each letter name in the word the child spontaneously sang the alphabet song].

***Mother and daughter aged 4.59 years*** (see Figure 1c):

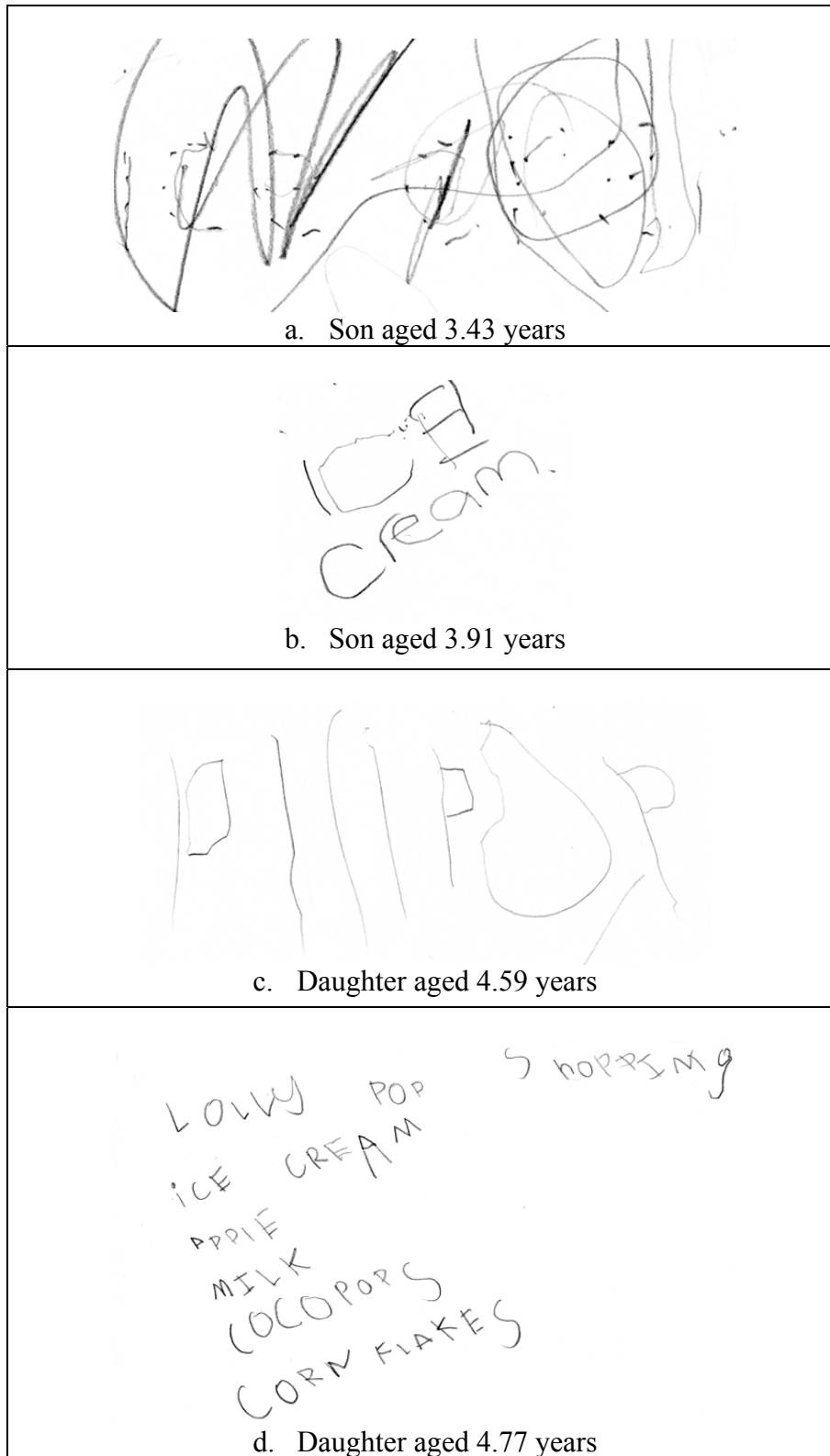
[To help her child shape the P in lollipop the mother pointed to the letter P in the sign “GROCERY SHOP” for the child to see].

Mother: “Look at the shop, see the word SHOP on the wall, look at the word on the wall see the P or see the Paddlepop, we need to write pop, see the letter P”.

[The child then wrote the letter *p* in her word *lollipop*].

A mother with daughter aged 4.77 years (see Figure 1d) dictated the name of each letter in the words lollipop and icecream then encouraged her child to copy words from the cereal boxes. The mother pointed to the letter C on the COCO POPS box situated on the grocery shelf and the child copied each letter from the label. The mother also pointed out the word CORNFLAKES then dictated the letter names for her to write. The child formed her letters in mostly upper case form and did not use letter sounds or spell any words independently.

*t*-tests were conducted to compare mothers who did ( $n = 4$ ) and did not ( $n = 31$ ) use environmental print to scaffold children’s writing on maternal print and grapho-phonemic mediation, emergent literacy skills, child age, and SES. There were no significant differences on any variables.



*Figure 1.* Children's writing samples where mothers used environmental print to scaffold their child's writing.



## Discussion

The present study extended previous research by examining joint writing in Australian English speaking mother-child dyads. We also explored how mothers naturally use environmental print to scaffold their child's writing. Although only a few mothers utilized environmental print they were observed using a variety of strategies resulting in rich print interactions. No differences were found between mothers who did and did not use environmental print on maternal mediation, child literacy skills, or demographic factors. We also examined the relationship between general maternal mediation of preschoolers' writing in an environmental print rich setting and children's emergent literacy skills. Of the emergent literacy skills assessed, only letter sound knowledge and print concepts were predicted by general maternal mediation strategies.

### General maternal mediation

In the present study, mothers displayed a range of mediation strategies to scaffold their child's writing in the environmental print setting. The strategies observed for print mediation included descriptive (e.g., m looks like a seagull in the sky) and directional language ('e' goes across and around) to help scaffold letter shaping. Mothers also linked letter names to common words the child knew (e.g., p for papa). These findings replicate those reported in previous research. For example, Aram (2010) described how parents used descriptive language to describe letters (e.g., this letter looks like a circle) or words children already knew (e.g., it's the first letter of your name) in order to scaffold children's printing and used the initial letter names of words the child already knew to scaffold word writing.

We were also interested in the relationship between maternal print and grapho-phonemic mediation within an environmental print-rich setting and children's emergent

literacy skills. Maternal print mediation and grapho-phonemic scores were both positively associated with children's letter-sound knowledge. Although speculative this suggests that the level of scaffolding mothers provided for letter shaping (e.g., using directional and descriptive language) and maternal assistance in the process of connecting letter shapes with their sounds during word writing may support the development of children's letter sound knowledge. As letter sound knowledge is strongly related to future reading and spelling ability (e.g., Adams, 1990), it may be beneficial to encourage mothers to scaffold letter shaping and link letters to sounds during joint writing activities. However, as correlation does not imply causation these results might equally be interpreted as the child's level of letter sound knowledge influencing maternal mediation. This could indicate that mothers may be more sensitive to children's letter sound knowledge when scaffolding but not to letter name knowledge or writing ability for which we found no significant relationships. Our finding of no association between letter name knowledge and maternal mediation is in contrast to Aram (2007)'s study where maternal grapho-phonemic and print mediation were both highly correlated with children's letter naming ability. It is possible that the age of the children may affect this relationship as the mean age of Aram's (2007) sample was 5 years 7 months and our sample's mean age was 4 years 3 months. These relationships may emerge later in children's development.

We also did not find any association between name and letter writing ability and maternal mediation. Perhaps the maternal guidance used in writing a shopping list may elicit different scaffolding strategies than name writing. If a joint writing task involved name writing, which is a more familiar word for young children than grocery-related words, it may be possible to find a relationship with the maternal strategies used. Children scored on average almost 5 out of 7 for name writing, evidencing their ability

to write part of their name without assistance. This indicated their familiarity with this word, and may explain its independence from the maternal mediation strategies used with unfamiliar word writing. Names are also one of the first words young children learn to write (Bloodgood, 1999; Clay, 1975). Thus, the level of writing task difficulty may have affected mothers' scaffolding strategies. For example, when mediating children's writing of unfamiliar words mothers may have used more lower level strategies (such as writing the word for the child to copy) in order to scaffold the more difficult task. Furthermore, the age of the children may have influenced the maternal strategies used. Bloodgood (1999) described how 3- to 4-year-olds have weaker motor skills and letter knowledge compared to their older counterparts, which may require mothers to adjust their guidance according to their child's ability.

Only grapho-phonemic mediation was related to print concepts. This result may indicate that mothers were providing higher levels of mediation to children who showed more advanced print concepts such as what letters and words are and how they are directionally positioned on a page. However, as correlation does not imply causation the alternative explanation that the child's level of print concepts shaped the mother's strategies is equally viable. Longitudinal studies are needed to clarify this causal path.

Finally, we found that maternal mediation was not related to children's phonological awareness. This is in contrast to other joint writing studies that found such a relationship (Aram & Levin, 2001; 2002). Again, the differences in the mean age of the children between Aram and Levin's and our study may have influenced these results. We suggest that the ability to hear rhyme and initial and final sounds in words may not be driving the sort of strategies that mothers use to help younger children produce written letters and words (such as using directional language to shape letters

and letter names to label them). Alternatively, maternal scaffolding of writing may not be driving development in phonological awareness and this skill may be more dependent upon developmental factors such as child age or ability in writing and name production.

### **Maternal use of environmental print**

Only four mothers used environmental print during the joint writing activity; however, our observational results provided some evidence of innovative uses of environmental print. The environmental print joint writing strategies involved mothers pointing out letters and whole words on product labels (e.g., ICECREAM, LOLLIPOP) or signs (e.g., GROCERY SHOP) for the child to copy. This was supplemented with descriptive and directional language to describe the physical shape of the letter in the environmental print (e.g., I goes straight down). The functional nature of the environmental print also engaged children's interest in the joint-writing task and provided further opportunities for discussions about the print. For example, the attention of one child was initially captured by the picture of icecream on the box. He described it as a hot air balloon then the mother drew his attention to the word. Another mother pointed to the letter I on the icecream box for her child to copy then the child pointed out the letter C himself and wrote it.

Further analyses comparing mothers who did and did not use environmental print during joint writing showed no differences in the level of maternal print and grapho-phonemic mediation nor in children's emergent literacy skills, child's age, or family SES. The lack of significant differences may be due to the very small number of mothers that actually used environmental print to scaffold their child's writing. Therefore, although we have provided evidence that some mothers refer to

environmental print it is not possible to draw conclusions about the benefits of this behaviour for emergent literacy. Nevertheless, the environmental print setting did provide a positive context whereby mothers and children engaged productively in the joint writing task and were observed to enjoy the literacy activity.

### **Practical implications and future research**

While most mothers did not use environmental print, the descriptions of those that did provided a glimpse into how mother's used this colourful and meaningful print to engage their child in the joint writing task. As this was not a commonly observed behaviour, parents in general may require coaching in using such strategies. Levin & Aram (2010) showed that coaching mothers in joint writing strategies had a positive effect on the development of children's letter knowledge, phonological awareness, word spelling and decoding. An extension of this research could investigate whether incorporating environmental print into mother-child writing activities enriches these interactions further. Aram (2002) also suggested that home writing activities (e.g., shopping lists, invitations, diaries, notes, recipes, and writing signs) are beneficial because they allow mothers to behave more freely and confidently with their children.

Aram (2002) described how activities that were more home-like (writing a list of names of people to be invited to a birthday party) resulted in a joint-writing atmosphere that was warmer and more cooperative than a school-like writing activity. Mothers appeared to be more directive and intrusive (e.g., demanding accuracy for letter shaping) in their mediation of more school-like writing activities. Environmental print could provide a promising tool for these home-like writing activities. For example, mothers could be encouraged to point out environmental print letters and words to their children during joint-writing tasks such as writing notes or a shopping list (e.g.,

referring to labels on grocery products, toys, or clothing). Environmental print could also be used in writing activities outside the home such as waiting in a bank (e.g., using bank signs to write bank memos), at a restaurant (e.g., using menu boards to write orders whilst waiting for a meal), or in a post-office (e.g., copying postcodes or town names from postal signs onto envelopes).

In addition, because environmental print is ubiquitous, involving no additional cost to its intended purpose (e.g., food products), and is easy to identify and read, the use of environmental print during joint writing may be beneficial in the teaching of both reading and writing in families from a range of cultural and SES backgrounds. Further research with a more diverse SES sample is required to determine whether maternal use of environmental print strategies during joint writing activities differ across SES. Research that directly manipulates the use of environmental print with a larger sample (for example by prompting mothers and children to use environmental print to help with a literacy task) is needed to determine whether it can foster emergent literacy skills in young children.

Mothers and children in the present study appeared to be engaged in the joint writing task however, it is not possible to determine the degree of enjoyment as this was not measured. Future research could assess enjoyment through a parent-child feedback questionnaire following the joint-writing task in a setting with or without environmental print. This would help determine to what extent an environmental print setting influences joint-writing interactions. Also, the outcomes of using environmental print to support joint writing interactions could be compared with using other print types (e.g., standard print in manuscript form) or other literacy activities (e.g., alphabet book reading). Finally, in order to increase ecological validity it may be necessary to observe

parents and children in real-life environmental print settings in the family's home. For example, Cameron & Pinto's (2009) study of seven 2-year-old girls and their families emphasized the advantages of using video observational methods to record parent-child interactions for a whole day. They reported that detailed analyses of video data that coded for both verbal and non-verbal interactions in the home setting can provide deeper insights into naturally occurring joint literacy activities.

### **Conclusion**

The general maternal mediation strategies during joint writing in the present study were similar to those reported in previous studies. However, fewer relationships were found between maternal mediation and emergent literacy skills compared with previous studies. This may have been due to the younger age of our child participants. We also observed some maternal use of environmental print during joint writing. Due to the few mothers who did this, the benefits of this behaviour remains unclear. However, the array of strategies used by this small group of mothers highlights the need for further investigation into the possible advantages of using environmental print to scaffold children's emergent writing.

## References

- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge: MIT press.
- Aram, D. (2002). Joint writing in Hebrew of dictated words versus proper names: Analysis of low SES mother-kindergartner dyads. *Journal of Research in Childhood Education, 17*, 47-61.
- Aram, D. (2006). Early literacy interventions: The relative roles of storybook reading, alphabetic activities and their combination. *Reading and Writing, 19*, 489-515.
- Aram, D. (2007). Sensitivity and consistency of maternal writing mediation to twin kindergartners. *Early Education and Development, 18*, 71-92.
- Aram, D. (2010). Writing with young children: a comparison of paternal and maternal guidance. *Journal of Research in Reading, 33*, 4-19.
- Aram, D., & Levin, I. (2001). Mother-child joint writing in low SES sociocultural factors, maternal mediation, and emergent literacy. *Cognitive Development, 16*, 831-852.
- Aram, D., & Levin, I. (2002). Mother-child joint writing and storybook reading: Relations with literacy among low SES kindergartners. *Merrill-Palmer Quarterly, 48*, 202-224.
- Aram, D., & Levin, I. (2004). The role of maternal mediation of writing to kindergartners in promoting literacy in school: A longitudinal perspective. *Reading and Writing: An Interdisciplinary Journal, 17*, 387-409.



- Aram D., & Biron, S. (2004). Joint storybook reading and joint writing interventions among low SES preschoolers: differential contributions to early literacy. *Early Childhood Research Quarterly, 19*, 588-610.
- Australian Government (2005). *National inquiry into the teaching of literacy: Teaching reading, report and recommendations* (Publication No. 0 642 77577 X). Canberra, Australian Capital Territory: Author.
- Baghban, M. (1984). *Our daughter learns to read and write: A case study from birth to three*. Newark Delaware: International Reading Association.
- Baghban, M. (2007). Scribbles, labels, and stories: The role of drawing in the development of writing. *Young Children, 62*, 20-26.
- Bloodgood, J. W. (1999). What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly, 34*, 342-367.
- Bowey, J.A. (1994). Phonological sensitivity in novice readers and nonreaders. *Journal of Experimental Child Psychology, 58*, 135-159.
- Brassard, M. R., Boehm, A. E. (2007). *Preschool assessment: Principles and practices*. New York: Guildford Press.
- Burns, M.S., & Casbergue, R. (1992). Parent-child interaction in a letter-writing context. *Journal of Reading Behaviour, 24*, 289-312.
- Cameron, C. A. & Pinto, G. (2009). A day in the life. Secure interludes with joint book reading. *Journal of Research in Childhood Education, 23*, 437-449.
- Campbell, R. (1998). A three year old learning literacy at home. *Early Years, 19*, 76-89.

- Clay, M. M. (1975). *What did I write? Beginning writing behaviour*. Auckland: Heinemann.
- Clay, M. M. (2005). *An observation survey of early literacy development*. Auckland: Heinemann.
- Clay, M. M. (2008). *Stones*. Rosedale, Northshore: Pearson.
- DeBaryshe, B. D., Buell, M. J., & Binder, J. C. (1996). What a parent brings to the table: Young children writing with and without parental assistance. *Journal of Literacy Research*, 28, 71-90.
- Diamond, K. E., Gerde, H. K., & Powell, D. R. (2008). Development in early literacy skills during the pre-kindergarten year in Head Start: Relations between growth in children's writing and understanding of letters. *Early Childhood Research Quarterly*, 23, 467-478.
- Dodici, B. J., Draper, D. C., & Peterson, C. A. (2003). Early parent-child interactions and early literacy development. *Topics in Early Childhood Special Education*, 23, 124-136.
- Dunn, L. M., & Dunn, D. M. (2007). *The Peabody Picture Vocabulary Test* (4<sup>th</sup> ed.). Bloomington, MN: NCS Pearson, Inc.
- Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. Patterson, J. Marshall & M. Coltheart (Eds.), *Surface dyslexia: Neuropsychological and cognitive studies of phonological reading*. (pp. 301-330). London: Erlbaum.
- Gerard, M. (2004). What's a parent to do?: Phonics and other stuff. *Childhood Education*, 80, 159-160.

- Goodman, Y. (1986). Children coming to know literacy. In W. H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (pp. 1-14). Norward, NJ: Ablex.
- Green, C. (1987). Parents' facilitation of young children's writing. *Early Child Development and Care*, 28, 129-136.
- Harste, J. C., Burke, C. L. & Woodward, V. A. (1981). Examining our assumptions: A transactional view of literacy and learning. *Research in the teaching of English*, 18, 84-108.
- Hecht, S., & Close, L. (2002). Emergent literacy skills and training time uniquely predict variability in responses to phonemic awareness training in disadvantaged kindergarteners. *Journal of Experimental Child Psychology*, 82, 93-115.
- Hollingshead, A. B. (1975). *The four-factor index of social status*. New Haven, CT: Unpublished manuscript. Yale University.
- Horner, S. L., (2005). Categories of environmental print: All logos are not created equal. *Early Childhood Education Journal*, 33, 113-119.
- Lass, B. (1982). Portrait of my son as an early reader. *The Reading Teacher*, 36, 20-28.
- Levin, I., & Aram, D. (2010). Mother-child joint writing and storybook reading and their effects on kindergartners' literacy: an intervention study. *Reading and Writing*. Published online 16 September 2010. DOI 10.1007/s11145-010-9254-y
- Levin, I., & Bus, A. G. (2003). How is emergent writing based on drawing? Analyses of children's products and their sorting by children and mothers. *Developmental Psychology*, 39, 891-905.

- Lomax, R. G., & McGee, L. M. (1987). Young children's concepts about print and reading: Toward a model of word reading acquisition. *Reading Research Quarterly, 22*, 237-256.
- Mason, J. M. (1980). When do children begin to read: an exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly, 15*, 203-227.
- Mayer, K. (2007). Emerging knowledge about emerging writing. *Young Children, 62*, 34-40.
- McGee, L. M., Lomax, R.G., & Head, M. H. (1988). Young children's written language knowledge: What environmental print and functional print reading reveals. *Journal of Reading Behaviour, 20*, 99-118.
- McGee, L. M. & Richgels, D. J. (1989). "K is Kristen's": Learning the alphabet from a child's perspective. *The Reading Teacher, 43*, 216-225.
- Miller, L. (1995). "I can read that". It says "Happy Shopper"- The role of environmental print in early literacy development. *Early years, 16*, 20-26.
- Molfese, V. J., Beswick, J. L., Molnar, A., & Jacobi-Vessels, J. (2006). Alphabetic skills in preschool: a preliminary study of letter naming and letter writing. *Developmental Neuropsychology, 29*, 5-19.
- Muter, V., Hulme, C., Snowling, M., & Taylor, S. (1997). Segmentation, not rhyming, predicts early progress in learning to read. *Journal of Experimental Psychology, 65*, 370-396.

- Neuman, S. B., & Roskos, K. (1993). Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal, 30*, 95-122.
- Neumann, M. M., Hood, M., & Neumann, D. L. (2009). The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal, 36*, 313-319.
- Neumann, M. M., & Neumann, D. L. (2010). Parental strategies to scaffold emergent writing skills in the preschool child within the home environment. *Early Years: An International Journal of Research and Development, 30*, 79-94.
- Neumann, M. M., Hood, M., Ford, R. M., & Neumann, D. L. (in press). The role of environmental print in emergent literacy. *Journal of Early Childhood Literacy*.
- Pinto, G., Accorti Gamannossi, B., Cameron, C. A. (2011). From scribbles to meanings: social interaction in different cultures and the emergence of young children's early drawing. *Early Child Development and Care, 181*, 425-444.
- Prior, J., & Gerard, M. (2004). *Environmental print in the classroom: Meaningful connections for learning to read*. Newark, DE: International Reading Association.
- Puranik, C. S. & Lonigan, C. J. (2011). From scribbles to scrabble: preschool children's developing knowledge of written language. *Reading and Writing, 24*, 567-589.
- Purcell-Gates, V. (1996). Stories, coupons, and the TV guide: Relationships between home literacy experiences and emergent literacy knowledge. *Reading Research Quarterly, 31*, 406-428.

- Ritchey, K. D. (2008). The building blocks of writing: Learning to write letters and spell words. *Reading and Writing, 21*, 27-47.
- Sinclair, A., & Golan, M. (2002). Emergent Literacy: A case-study of a two-year-old. *Early Child Development and Care, 172*, 555-572.
- Snow, C. E., Burns, S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Stellakis, N., & Kondyli, M. (2004). The emergence of writing: Children's writing during the pre-alphabetic spelling phase. *Educational Studies in Language and Literature, 4*, 129-150.
- Sulzby, E., Barnhart, J., & Hieshima, J. A. (1989). Forms of writing and rereading from writing: A preliminary report. In J. Mason (Ed.), *Reading –writing connections* (pp. 31-63). Boston, MA: Allyn & Bacon.
- Teale, W. H., & Sulzby, E. (1986). Emergent literacy as a perspective for examining how young children become readers and writers. In W. H. Teale & E. Sulzby, (Eds.), *Emergent Literacy: Reading and Writing* (pp. 7-25). Norwood, NJ: Ablex Publishing.
- Tolchinsky, L. (2003). The cradle of culture and what children know about writing and numbers before being taught. Mahwah, NJ: Lawrence Erlbaum.
- Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early Childhood Research Quarterly, 9*, 153-170.
- Vukelich, C., Christie, J., & Enz, B. (2008). *Helping young children learn language and literacy: Birth through kindergarten*. Boston, MA: Pearson.

Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*.

Cambridge, MA: Harvard University Press.

Welsch, J. G., Sullivan, A., & Justice, L. M. (2003). That's my letter!: What preschoolers' name writing representations tell us about emergent literacy knowledge. *Journal of Literacy Research, 35*, 757-776.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development, 69*, 848-872.

Wood, D., Bruner, J. C., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89-100.

Yamagata, K. (2007). Differential emergence of representational systems: drawings, letters and numerals. *Cognitive Development, 22*, 244-257.

Yang, H., & Noel, A. M., (2006). The developmental characteristics of four- and five-year-old preschoolers' drawing: An analysis of scribbles, placement patterns, emergent writing, and name writing in archived spontaneous drawing samples. *Journal of Early Childhood Literacy, 6*, 145-162.

## Chapter 7 Prelude

### Multisensory Methods for Early Literacy Learning

Multisensory strategies were observed in the case Studies 1 and 2. The mother and child interacted with environmental print by looking and pointing to letters (visual), saying and hearing their names and sounds (auditory), forming letter shapes in the air (kinaesthetic), and tracing their shapes (tactile) on product labels. Similar types of multisensory strategies were used by mothers in the observational Studies 3 and 4. In the grocery shop play setting, mothers pointed out environmental print letters and words on product labels or shop signs, referring to letter names and sounds (visual-auditory), tracing print with fingers (tactile), and writing letters in the air (kinaesthetic) during the joint writing task. These multisensory activities helped engage children's participation in these print interactions. To further investigate the benefits of multisensory methods for early literacy learning, with a view to informing the intervention Study 5, a review of the literature was conducted.

Chapter 7 is a review of multisensory methods for early literacy learning. It is a book chapter currently in press (in *Beyond the Lab: Applications of Cognitive Research in Memory and Learning*) and begins by describing the neurophysiological basis for multisensory processing followed by a review of studies that have examined the effects of using multisensory methods to enhance emergent literacy. Although there is little empirical work to date on the efficacy of multisensory methods and the existing research is somewhat limited due to its quasi-experimental nature, there is some evidence to suggest that a multisensory approach may foster emergent literacy (Bara, Gentaz, Cole, & Sprenger-Charolles, 2004; Joshi, Dahlgren, & Boulware-Gooden, 2002; Zafrana, Nikoltsou, & Daniilidou, 2000). For example, these studies encouraged



children to trace letter shapes with fingers whilst saying their names and sounds and formed these shapes in the air. Based on these positive findings and the observed use of multisensory activities in the preceding case and observational Studies 1 to 4, multisensory strategies were integrated into the intervention program in Study 5.

## Statement of contribution to Chapter 7 co-authored

### Book chapter in press

**Neumann, M. M., Hyde, M., Neumann, D. L., Hood, M., & Ford, R. M. (in press).  
Multisensory methods for early literacy learning. Edited book *Beyond the  
Lab: Applications of Cognitive Research in Memory and Learning*. Accepted:  
7/3/2011.**

This chapter includes a co-authored book chapter in press. The bibliographic details of the co-authored book chapter, including all authors, are:

Michelle M. Neumann, Emeritus Professor Merv B. Hyde, Associate Professor David L. Neumann, Dr Michelle Hood, Dr Ruth M. Ford.

My contribution to the book chapter involved the literature review and writing of the book chapter review. Thank you to Sharon Dookharam for assistance in conducting the literature search. The co-authors provided review of drafts.

Name of Student: Michelle Neumann

(Signed)

Corresponding authors of the book chapter:

Name of Corresponding Authors:

(Countersigned) Emeritus Professor Merv Hyde

(Countersigned) Associate Professor David Neumann

(Countersigned) Dr Michelle Hood

(Countersigned) Dr Ruth Ford

(Countersigned) Dr Michelle Hood

Supervisor: Name of Supervisor

In order to comply with copyright Chapter 7 has been removed from this copy.

## **Chapter 8 Prelude**

### **Using Environmental Print to Enhance Emergent Literacy and Print Motivation (Study 5)**

The longitudinal case Studies 1 and 2 described how two children showed an interest in meaningful and ubiquitous environmental print from an early age and how through scaffolded interactions with the letters embedded in this print, their emergent literacy skills were fostered prior to formal schooling. This showed that environmental print could be used in the home environment to foster emergent literacy, but being case studies were limited in generalisability. The observational studies of mother-child dyads interacting with salient environmental print in a grocery shop setting during play (Study 3) and joint-writing task (Study 4) also provided evidence of how using this type of print is related to emergent literacy. However, as only a small percentage of mothers used environmental print to teach their child about print in the grocery shop setting and during joint writing, it was not possible to establish whether using environmental print as a scaffolding tool enhances literacy learning. Existing intervention studies (Prior, 2003; Salewski, 1995, Vera, 2007; Wepner, 1985) have provided evidence of the benefits of using environmental print as a tool to foster emergent literacy however these studies had some methodological limitations, in particular, the quasi-experimental nature of the research.

Study 5 reports the results of a preschool-based intervention study. This study is currently submitted to an international peer-reviewed journal and has been invited for resubmission. It aimed to determine whether using environmental print was more effective than using standard print (the same environmental print words printed on white card in black manuscript form) to enhance emergent literacy and print motivation. It was important to compare environmental print with standard print because some

researchers suggest that the contextual cues (e.g., logo, colours) in environmental print distract children from examining the print itself and that exposure to environmental print labels and signs does little to promote letter learning or conventional reading (Ehri & Roberts, 2006; Masonheimer, Drum, & Ehri, 1984). Comparing these print types would establish to what extent the colourful, bold, attractive, and functional nature of environmental print affects the growth of emergent literacy skills and print motivation over the same intentional and scaffolded use of standard print. In addition, both of these interventions were compared to a non-intervention control group who experienced only regular preschool classroom activities, in order to control for normal literacy development. To improve on the methodological limitations of previous environmental print research and gain a more valid view of the effect of environmental print on emergent literacy growth, children were randomly assigned to groups, pure print-based activities were used (e.g., not mixed with storybook reading), a broader range of emergent literacy skills were assessed and medium term follow-up tests conducted.

Children aged 3 to 4 years ( $N = 73$ ) were randomly assigned to one of three groups (environmental print intervention, standard print intervention, or no-intervention control). They were tested on letter name and sound knowledge, letter writing, print concepts, environmental print and standard print word reading, and print motivation prior to the intervention (pre-test), immediately post-intervention (post-test), and 2 months later (follow-up test). The intervention program, conducted by the author (a trained teacher), consisted of one 30-minute session per week for 8 weeks at the child care centres. The same program was used for both the environmental print and standard print groups, except that the print type differed. The intervention programs utilised multisensory strategies based on those observed in Studies 1 – 4 and on the existing literature on multisensory methods reviewed in Chapter 7. For example, pointing out

print, encouraging children to visually attend to letter shapes in environmental print words, saying the letter's name and sound, moving hands and arms in the shapes of letters in the air, and tracing letters with fingers. The results of this study showed that the environmental print intervention produced significantly greater growth in several aspects of emergent literacy and print motivation than the comparison groups. This provides strong empirical evidence supporting the use of environmental print as a literacy learning tool in a preschool setting.

**Statement of contribution to Chapter 8 co-authored  
paper under review**

**Neumann, M. M., Hood, M., & Ford, R. M. (under review) Using environmental  
print to enhance emergent literacy and print motivation.**

This chapter includes a co-authored paper under review. The bibliographic details of the co-authored paper, including all authors, are: Michelle. M. Neumann, Dr Michelle Hood, Dr Ruth M. Ford.

My contribution to the paper involved the literature review, writing of the paper, data collection, and statistical analyses. The co-authors provided review of drafts and supervisory advice.

Name of Student: Michelle Neumann

(Signed)

Corresponding authors of paper:

Name of Corresponding Authors:

(Countersigned) Dr Michelle Hood

(Countersigned) Dr Ruth Ford

(Countersigned) Dr Michelle Hood

Supervisor: Name of Supervisor

## **Chapter 8**

### **Using Environmental Print to Enhance Emergent Literacy and Print Motivation**

Michelle M. Neumann, Michelle Hood, & Ruth M. Ford

School of Applied Psychology, Griffith University, QLD 4222, Australia

Please direct correspondence to:

Michelle Neumann: School of Applied Psychology, Gold Coast Campus, Griffith

University, QLD 4222, Australia. E-mail: [michelle.neumann@griffithuni.edu.au](mailto:michelle.neumann@griffithuni.edu.au)

Facsimile: +61(0)7 5552 8291, Telephone: +61(0)7 5552 8052.

### Abstract

Given the ubiquitous and salient nature of environmental print, it may be an ideal tool to scaffold emergent literacy in non-reading preschool children. To investigate this, a randomised, controlled intervention study was conducted that evaluated the effects of using environmental print in context ( $n = 25$ ) compared to standard print (the same labels in manuscript form;  $n = 23$ ) and a no intervention control ( $n = 25$ ) on children's (aged 3 - 4 years) emergent literacy and print motivation. The same multisensory program (30 minutes per week for 8 weeks) was used for each intervention group. Emergent literacy and print motivation were measured pre-, post- and 2-months (follow-up) after the intervention. Groups did not differ significantly on measures at pre-test. The environmental print group outperformed the control group on letter sound knowledge, letter writing, environmental print and standard print reading, and print motivation at post-test and follow-up; and on print concepts at post-test only. The standard print group was only better than the control on letter writing and standard print word reading at post-test and these gains were not sustained. The environmental print group outperformed the standard print group on print motivation and environmental print reading at both post- and follow-up and letter writing at follow-up. There were no differences across groups on letter name knowledge. Effect sizes for these differences ranged from moderate to large ( $d = 0.67 - 1.43$ ). This shows that environmental print can be used in preschool settings to facilitate emergent literacy development and foster children's interest in print.

*Key words:* environmental print, emergent literacy, letter knowledge, print motivation, preschool intervention, multisensory



### **Using Environmental Print to Enhance Emergent Literacy and Print Motivation**

In recent years, educators, researchers, and government bodies have focused on the acquisition of emergent literacy skills in the years before school, because of their impact on a child's future reading ability (Australian Government, 2005; Snow, Burns, & Griffin, 1998). These emergent literacy skills include alphabet knowledge (e.g., Levin, Shatil-Carmon, & Asif-Rave, 2006), print concepts (e.g., Justice & Ezell, 2001), and emergent writing (e.g., Aram & Biron, 2004). In addition, fostering a young child's relative interest in literacy activities (*print motivation*; Whitehurst & Lonigan, 1998) prior to school-entry is likely to benefit future literacy skills (Baker, Scher, & Mackler, 1997).

It is generally accepted that prior to using the alphabetic system to read words, preschool children read logographically (e.g., Frith, 1985; also referred to as the pre-alphabetic phase, Ehri, 1995) using salient visual cues to recognise print; for example, the large golden M for McDonald's or the red appearance of the stop sign. As children in this phase use rudimentary strategies to gain meaning from print and do not use grapho-phonemic cues, the pre-alphabetic phase is not considered part of the reading system as conceptualised by current reading models (Ehri, 2005; see also Jackson & Coltheart, 2001). However, at around 5 to 6 years of age typically developing children transition into the partial alphabetic phase where they begin to use initial and final letter-sounds to decode words. In the full-alphabetic phase they have mastered letter names and sounds and the alphabetic principle and use sequential phonological decoding to read words. This is followed by fluent and conventional word reading (consolidated phase; Ehri, 1995).

The present study focused on children's emergent literacy skills in the pre-alphabetic phase. Emergent literacy develops during this phase from birth through socio-cultural experiences with surrounding print (Bowman & Treiman, 2004; Teale & Sulzby, 1986; Whitehurst & Lonigan, 1998). During the preschool years, children are exposed to print not only through storybooks (Justice & Ezell, 2002) but also through brightly coloured and visually attractive environmental print (Horner, 2005; Mason, 1980; McGee & Richgels, 1989; Vera, 2007). Environmental print is surrounding non-continuous print in context that fulfils real-life functions (Adams, 1990; Hall, 1987; Kassow, 2006; Vukelich, Christie, & Enz, 2008). Examples of environmental print include labels on food and toy packaging, clothing, road signs, and billboards (Horner, 2005). In context, this type of print is bold and large and appears in a variety of sizes, colours, shapes, and fonts, generally in capital letters without conventional punctuation.

There are two views regarding the role of environmental print in emergent literacy (for a detailed discussion see Neumann, Hood, Ford, Neumann, in press). One view is that environmental print does little to promote early reading skills because preschoolers (3- to 5-year-olds) pay little attention to print on commercial products, especially when pictures and salient cues are present (Goodall, 1984; Kassow, 2006; Masonheimer, Drum, & Ehri, 1984). From this perspective, children engage in *logographic* reading whereby they use visual cues (e.g., elements of the logo) rather than letter-sound analysis skills to decode the print (Frith, 1985). This is confirmed by researchers who have shown that young children are unable to read the environmental print words when the contextual cues found in the signs and labels are removed and the words presented in standard black manuscript form (Cloer, Aldridge, & Dean, 1981/1982; Goodall, 1984; Hiebert, 1978; Masonheimer et al., 1984; Sonnenschein & Munsterman, 2002). Further evidence indicates that environmental print reading is a

poor predictor of conventional word reading ability (Dickinson & Snow, 1987; Ehri & Roberts, 2006; Kassow, 2006; Masonheimer et al., 1984). In addition, a meta-analysis conducted by the National Early Literacy Panel (NELP, 2008) examined the predictive value of preschool-aged emergent literacy skills for conventional literacy skills at school-age. Environmental print reading, defined as the ability to identify common products or signs (e.g., McDonald's, Coke), was weakly correlated with kindergarten-aged letter-sound decoding skills ( $r = .28$ ) and school-aged spelling skills ( $r = .25$ ).

An alternative view is that logographic reading is positively related to emergent literacy skills, which, in turn, predict conventional reading (Lomax & McGee, 1987; McGee, Lomax, & Head, 1988). For example, Lomax and McGee (1987) found a positive relationship between logographic reading of printed labels or signs (e.g., Coke can, Pac-Man cereal box, M&Ms candy bag, Stop sign, 7-Eleven cup) and letter knowledge in children aged 3 to 6 years. In turn, letter name and sound knowledge were related to word reading. These findings support the view that environmental print is related to emergent literacy and provides children with their first meaningful experiences with print (Bastien-Toniazzo & Jullien, 2001; Harste, Burke, & Woodward, 1981; Lass, 1982; Lujan & Wooden, 1984; McGee & Richgels, 1989).

Accordingly, it has been suggested that adults could use environmental print as a tool to scaffold emergent literacy (e.g., Enz, Prior, Gerard, & Han, 2008; Vukelich et al., 2008). Children might be able to learn to separate letters from non-print context through repeated exposure to environmental print and scaffolding by a more knowledgeable other (Adams, 1990; Blair & Savage, 2006; Vera, 2007). Scaffolding refers to providing children with enough tools to support their learning (Wood, Bruner & Ross, 1976) within their zone of proximal development or the distance between what

a child can do with versus without assistance (Vygotsky, 1978). Adults can help children make sense of environmental print and use it to promote emergent literacy skills by guiding and scaffolding their interactions with it; for example, by pointing out letters and words in the environmental print (Neumann & Neumann, 2010; Neuman & Roskos, 1993; Vukelich, 1994). When letters are mastered environmental print scaffolding is longer required. Therefore, environmental print may be a potential tool to foster emergent literacy skills.

Parents and early childhood educators read environmental print to children (e.g., signs, product labels) during everyday experiences and help them identify words (e.g., Rice Krispies) embedded in environmental print (Baghban, 1984; Goodman, 1986; Harste et al., 1981; Mason, 1980; McGee & Richgels, 1989; Purcell-Gates, 1996; Vera, 2007). Case studies have described how children interact spontaneously with environmental print from an early age (Baghban, 1984; Lass, 1982; Lujan & Wooden, 1984; McGee & Richgels, 1989; Neumann, Hood, & Neumann, 2009; Neumann & Neumann, 2010; Sinclair & Golan, 2002). McGee and Richgels (1989) also reported how parents can foster their child's letter knowledge using environmental print by talking about familiar signs and labels. However, case studies are limited in their generalisability.

Several quasi-experimental studies have investigated the use of environmental print as an emergent literacy tool (Prior, 2003; Salewski, 1995; Vera, 2007; Wepner, 1985). For example, Wepner (1985) randomly assigned 3- to 4-year-olds ( $N = 20$ ) to an 8-week environmental print intervention or control group. All children were pre- and post-tested on book handling, logo identification, reading attitude, and word/sentence identification. The intervention group created personalised books using environmental

print logos. During each weekly 20-minute session, the intervention group was introduced to a new logo (e.g., Burger King) and pasted it into their book. The instructor wrote each child's dictated sentence (e.g., Jessica loves Burger King) beside the logo in their book, reading each sentence aloud. At post-test, the intervention group could identify more logos than the control group. Pre- to post- book handling skills improved slightly in the 3.5-year-old intervention group but ceiling effects occurred in the older age group. Pre to post improvements in word/sentence identification and reading attitude were found in the intervention group but not in the control group. However, no tests of statistical significance were conducted so it is not known whether the differences reported were greater than would be expected due to chance.

A similar but larger-scale study was conducted by Salewski (1995) with kindergarten children aged 4 to 5 years ( $N = 68$ ). The intervention and control groups were pre- and post-tested on a 20-item logo test and Clay's (1979) Word Reading Test. In the logo test, children were asked what each logo (e.g., Lego, Shell, Safeway, Sun Rype Apple Juice) said when presented in full context (as a photograph on its product), partial context (as a photograph with original colour and stylised print but not on the product), and context free (logo printed in black manuscript letters on card). The intervention group received two 30-minute sessions per week over 4 weeks. During each session, two new logos were presented and children created sentences related to each with the researcher (e.g., I eat at McDonalds). Logos were pasted into personalised books accompanied by pictures, words, and sentences written by the child or researcher. The control group participated in story-telling and book related activities. The intervention group obtained significantly higher post-test scores across all contexts of logo presentation when compared to the control group. There were no significant

between-group differences on Clay's Word Reading Test. However, the interpretation of these findings is limited as individual children were not randomly assigned to groups.

Neither Wepner (1985) nor Salewski (1995) examined the effect of environmental print instruction on letter knowledge. Letter name and sound knowledge is one of the strongest predictors of future reading ability (e.g., Adams, 1990; Ehri & Wilce, 1985; Foulin, 2005; Justice, Pence, Bowles, & Wiggins, 2006) and, therefore, should be an important outcome for early intervention programs. More recently, Vera (2007) used environmental print to teach alphabet letters as well as print concepts in a 9-week preschool intervention using a range of literacy activities ( $N = 56$ ). Children in the environmental print group brought popular culture environmental print logos from home (e.g., cartoon/TV/movie characters, toys). The activities included matching a logo (e.g., *Care Bears*) with the same word written on card in standard print, creating logo books, writing or forming beginning letters of logos with play dough, and pointing to environmental print letters and words on a wall. Letters taught were not specified as teachers in different classes selected letters according to children's interest in a particular logo. Children in the environmental print group were also given daily instruction to develop their print concepts by shared reading of big books and alphabet books and were taught book handling skills and letter and word concepts. The control group used children's and teacher's names, calendar months, word walls, and alphabet books to learn letters and was taught print concepts using levelled readers through similar instructional methods to the environmental print group. Post-intervention, the environmental print group's recognition of 26 upper case letters (whether letter names or sounds were scored was unspecified) and print concepts were significantly greater than those of the control group. However, assignment to groups in this study was also not random and follow-up tests were not conducted to determine whether the

environmental print group sustained these effects after the program ended. Moreover, the fact that the environmental print group were instructed using other literacy materials, such as big books and alphabet books, means that the unique contribution of environmental print could not be ascertained.

These investigations provided preliminary evidence that short-term interventions in preschool settings using environmental print may enhance children's logographic reading skills, letter recognition, and print concepts (Salewski, 1995; Vera, 2007; Wepner, 1985), as well as their attitude to reading (Wepner, 1985). Nevertheless, further research is needed that uses random assignment to groups, pure environmental print activities, and measures of letter name and sound knowledge. In addition, no studies to date have examined the effects of environmental print instruction on letter writing. Early writing and reading development are strongly related (Adams, 1990; Clay, 1975; Teale & Sulzby, 1986). For example, it has been reported that letter writing is positively related with alphabet knowledge (Molfese, Beswick, Molnar, & Jacobi-Vessels, 2006; Ritchey, 2008) and that it predicts more advanced skills such as word writing and spelling (Hetch & Close, 2002). It has been suggested that integrating the teaching of letter writing into early literacy programs may benefit both early reading and writing development (Bloodgood, 1999; Ritchey, 2008). Given that, only a few case studies have demonstrated children's use of environmental print in their letter and word writing (e.g., Neumann & Neumann, 2010; Chan, Juan, & Lai Foon, 2008) it makes sense to examine the use of environmental print to scaffold letter writing.

A closer look at the effects of environmental print exposure on print motivation is also warranted given Wepner's (1985) finding that it enhanced children's attitudes to reading. Whitehurst and Lonigan (1998) defined print motivation as a child's relative

interest in reading and writing activities. Children's interest in surrounding print and child-initiated interactions with print are thought to be important behavioural indexes of emerging motivations for reading (Baker et al., 1997). The attractive visual nature of environmental print suggests it should promote print motivation (Salewski, 1995; Vera, 2007; Wepner, 1985). On the other hand, the bright colours and logos might distract children from examining the print itself, providing little benefit to reading development (Ehri & Roberts, 2006; Masonheimer et al., 1984). To our knowledge, no studies have compared the effectiveness of environmental print versus standard print as tools for scaffolding children's emergent literacy and print motivation. Such an approach would help to determine whether the unique appearance of environmental print helps or hinders young children's learning of print.

### **The Present Study**

This study built on existing research to determine whether environmental print enhances emergent literacy and print motivation. Random assignment to groups was used to ensure equivalency of groups prior to intervention. Measures of letter sound and name knowledge and letter writing were assessed, along with print concepts, print motivation, logo reading (environmental print in context), and standard print reading. This ensured a broad range of emergent literacy skills were assessed and allowed us to determine whether reading the environmental print as logos would translate into reading the same words in standard print. Previous environmental print studies only assessed children's skills immediately following the intervention (Prior, 2003; Salewski, 1995; Vera, 2007; Wepner, 1985). We extended this to examine whether any gains were sustained over the longer term (two months after the intervention ended). This was to rule out potential criticisms that the children were simply primed by their immediate



environment or had “learned the answers” but that this would disappear as soon as the training stopped. Demonstrating that these gains were sustained would provide a more powerful test of the intervention than the simple pre-post design.

An 8-week randomised control intervention was conducted with weekly 30-minute sessions in typically developing English-speaking 3- to 4- year-olds. Instruction using environmental print was compared to identical instruction using standard print (same words in black manuscript form on white cards) and a control condition that did not receive the literacy intervention. The intervention program did not include additional storybook activities (cf. Vera, 2007). This allowed us to clarify the extent to which environmental print alone specifically enhances print knowledge.

For both intervention groups, an identical multisensory instruction strategy was used. Although little empirical evidence exists on the efficacy of multisensory approaches in early literacy programs, they are thought to benefit children’s literacy learning because they simultaneously stimulate all the senses consolidating memory pathways in the brain (Birsh, 2006; Moats & Farrell, 2005). Tactile and kinaesthetic activities such as tracing the outline of letters with fingers improved visual memory in normal and delayed readers (Hulme, 1981) and enhanced letter knowledge and letter writing in young children (e.g., Bara, Gentaz, Cole, & Sprenger-Charolles, 2004; Zafrana, Nikoltsou, & Daniilidou, 2000). Neumann, Hyde, Neumann, Hood, and Ford (in press) provide a detailed review of multisensory methods for early literacy learning. Thus, we incorporated tactile and kinaesthetic activities along with visual (looking at letters) and auditory (saying the letter name and sound) activities.

Given evidence of a strong contribution of the home literacy environment to a child’s early literacy development (e.g., Haney & Hill, 2004; Saracho, 1997; Weigel, Martine, & Bennett, 2006), we also measured the child’s home literacy activities at pre-

intervention in order to ensure the groups did not differ on this other source of literacy enrichment. Previous environmental print intervention studies (e.g., Prior, 2003; Salewski, 1995) did not check whether groups differed in their home literacy experiences; therefore, differences in this could potentially explain any group differences found, especially as they also did not randomly assign to groups. In the present study, we measured home reading, use of environmental print, literacy teaching, alphabet resources, and writing activities, as well as parent's familiarity with children's book titles (an index of parent home literacy behaviours) pre-intervention. We also assessed children's receptive vocabulary prior to the intervention to ensure there were no pre-existing group differences and to screen out any children with language impairments

It was hypothesised that children in the environmental print group would show improved performance compared to the control group on letter name and sound knowledge, letter writing, print concepts, environmental print and standard print word reading, and print motivation immediately following the intervention and would sustain those gains 2 months after the intervention had ceased. Differences in emergent literacy and print motivation outcomes between the environmental print and standard print groups were also examined.

Reading environmental print words in context and in standard print was expected to improve in the environmental print group because previous studies showed that children's logographic reading improves following exposure to logos (Kuby & Aldridge, 2004; Wepner, 1985) and can transfer to reading of the words in manuscript form (Cronin, Farrell, & Delaney, 1999; Kuby, Aldridge, & Snyder, 1994). Similarly, we expected letter knowledge, print concepts, and print motivation to improve based on

prior evidence that environmental print enhanced these (Salewski, 1995; Vera, 2007; Wepner, 1985). We expected environmental print to produce sustained effects after the end of the intervention because environmental print is visually attractive and ubiquitous and children trained in identifying letters embedded in environmental print words may continue to seek them out, initiating interactions with this print outside of the classroom.

## Method

### Participants

The sample comprised 73 typically developing English speaking preschool aged children ( $M = 4.12$  years;  $SD = 0.24$ ; Range = 3.53 – 4.81 years). The children (37 boys and 36 girls) were recruited from four childcare centres on the Gold Coast in Queensland, Australia. At the centres, there was no formal instruction in reading or writing. To ensure all children were typically developing, any with known speech or language, hearing (or who had grommets fitted due to chronic ear infections), or eyesight problems or who had experienced serious illness or injury likely to impact normal development (based on parent report) were excluded. Children for whom English was not their main language were also excluded because language minority children vary greatly in their response to literacy interventions (Vadasy & Sanders, 2010). Children with standard receptive vocabulary scores below 80 on the Peabody Picture Vocabulary Test 4<sup>th</sup> Edition (PPVT-IV, Dunn & Dunn, 2007) were also excluded because of the potential that they had speech and/or language impairments.

Finally, children who knew more than seven letter sounds were excluded. This was to ensure that the sample had typical letter knowledge for their age and that any precocious children, who may not have benefited from the intervention, were excluded. Worden and Boechetter (1990) showed that 4-year-olds know 6 letter sounds on

average. They also reported that 80% of 4-year-olds know between 6 and 26 letter names. Letter sound knowledge was selected as the basis for exclusion due to this wider range of typical letter name knowledge, which, if used for exclusion, would have likely resulted in a greatly restricted sample.

Most mothers were married or in a de facto relationship (79.5%), with 16.4% divorced or separated, and 4.1% single or never married. Family socio-economic status (SES) was calculated using the Hollingshead 4-factor Index (Hollingshead, 1975) based on parental education and occupation. The mean SES fell in the middle SES range of 40 to 54 ( $M = 46.30$ ;  $SD = 9.91$ ; Range 14 - 61). Of the mothers, 4.2% completed to grades 7 to 9, 11.1% completed 10<sup>th</sup> or 11<sup>th</sup> grade, 13.8% were high-school graduates, 43.1% had partial college/specialise training, 18.1% were university graduates, and 9.7% had postgraduate training. Of the fathers, 2.9% completed to grades 7 to 9, 17.5% completed 10<sup>th</sup> or 11<sup>th</sup> grade, 15.9% were high-school graduates, 44.9% had partial college/specialise training, 15.9% were university graduates, and 2.9% had postgraduate training. The mode occupational status for mothers was professional (45%) and for fathers was trades-persons and related workers (35%).

## **Procedure**

Ethical clearance was granted by the author's university ethics committee. The study was advertised at four different childcare centres in the Gold Coast area. An invitation to participate was given to parents of children aged between 3 ½ and 4 ½ years. Four children for whom parents provided consent did not participate (two were excluded due to a speech delay and grommets, one left their childcare centre prior to the intervention, and one withdrew prior to the intervention). There was no attrition of participants during the intervention or at post or follow-up test times.

In order to ensure that each childcare centre had at least one of each group (environmental print, standard print, and control group) random assignment of participants to groups was done within each centre. Children at each centre were randomly assigned to a group so that each instructional group had 4 to 5 children. Each centre had at least one of each group, with one centre having two environmental print groups and another having two standard print groups and two control groups due to different numbers of participants at each centre. Overall, roughly equivalent numbers of boys and girls were assigned to environmental print (12 boys, 13 girls), standard print (13 boys, 10 girls), or control (12 boys, 13 girls) groups. The mean age for each comparison group was: environmental print (4.2 years;  $SD = 0.20$ ), standard print (4.1 years;  $SD = 0.26$ ) and control group (4.0 years;  $SD = 0.25$ ).

The first author, a registered teacher, provided the intervention programs to all groups in a quiet room at the childcare centres once a week for 8 weeks. Children were taken out of their individual classrooms to participate in each intervention session. Each session was videotaped so that treatment fidelity and program adherence could be checked. Children's attendance at each weekly session was recorded. During this 8-week period, the control group received their regular play-based childcare program. When the study had ended, following the 2-month follow-up assessments, the control group was provided with the environmental print intervention program.

Parents completed a questionnaire regarding demographic details and home literacy practices. Following this, pre-tests of emergent literacy and print motivation were administered over a 2-week period immediately before the intervention. Receptive vocabulary was also assessed at this time. Individual tests were administered in a random order. Testing took approximately 30 minutes. Post-tests on the emergent

literacy and print motivation battery were conducted over a 2-week period immediately following the intervention and again 2 months later. All testing was conducted individually by the first author in a quiet room at children's childcare centres. Children were thanked with stickers at the completion of each test session.

## Measures

**Letter name and sound knowledge.** Children were presented with the 26 alphabet letters printed in upper-case black Century Gothic font size 72 on individual 8 x 8 cm white cards in random order. Children were asked the letter name and sound (score of one point each). Letter sounds was scored so that each letter had a single correct pronunciation: the short sounds for vowels (e.g., the sound *o* makes in *cot* not in *vote*) and hard sounds for C, G (e.g., the sound *g* makes in *goat* not in *giraffe*) and /ks/ for X (as in *fox*).

**Letter writing.** To ensure children were given the same amount of time to write, each child was asked to write all the letters they could in 60 seconds and this was timed using a stopwatch. If children stopped early they were prompted to write more. Each letter written in conventional form scored one point, repeated letters were counted only once, and upper and lower case letters were given one point each (e.g., B and b). The scoring of conventionally formed letters was based on writing samples and descriptions by Gentry (2005). The number of letters written was tallied to give a total letter writing score.

**Print concepts.** (Clay, 2005). Ten items suitable for non-reading children of the target age range were selected from this 24-item test that assesses children's awareness and knowledge about print. Selected items included "Point to the first word on this page" and "Point to a little letter". The items were administered in the context of the

examiner reading a storybook (Sand; Clay, 2008) to the child. Children scored 1 for each correct response. The 24-item test has an acceptable split half reliability (.84 to .89) and validity (.64 to .79; Brassard & Boehm, 2007). For the selected 10 items used with our sample, internal consistency (Cronbach's alpha) was .64 at pre-test .71 at post-test, and .73 at 2-month follow-up.

**Environmental print word reading.** This test design and scoring system was similar to previous environmental print studies (Blair & Savage, 2006; Lomax & McGee, 1987). Environmental print words were selected based on the parent survey in the home questionnaire of most familiar environmental print children knew and those that were common in the local area. Ten environmental print items (MILO, EXIT, FROOT LOOPS, LEGO, CORN FLAKES, SUBWAY, RICE BUBBLES, STOP, NUTRI-GRAIN, PEPSI) were randomly presented in full context (e.g., on a cereal box). The examiner ran her finger under the label asking, "What does this say?" Children scored 2 for each correctly identified label; 1 for a meaningful attempt (e.g., saying "cereal" for CORNFLAKES), and 0 for no response or a response unrelated to the item (e.g., "car" for "PEPSI") with a maximum score of 20. Each environmental print item was presented individually then immediately put away from view.

**Standard print word reading.** The same 10 environmental print words were printed in black Century Gothic font size 120 on 10 x 20 cm white card and presented in random order. The examiner ran their finger under the word asking, "What does this say?" Children scored 1 for each correct item.

**Print motivation.** Three items on this interview questionnaire regarding motivation for storybook reading (likes/dislikes when someone reads them a book; likes/dislikes to read books by themselves; thinks reading is boring/fun) were used from

Baker and Scher's (2002) Motivations for Reading Scale. An additional three items on writing (e.g., likes/dislikes to do writing; likes/dislikes when someone helps them write; thinks writing is boring/fun) and three items on environmental print reading (likes/dislikes to read signs e.g., a stop sign; likes/dislikes to read letters and words on boxes; thinks reading signs is boring/fun) were written for this study. Two filler items (likes/dislikes brushing their teeth; likes/dislikes eating broccoli) were also included. As per Baker and Scher's procedure, two identical puppets were used. One of the puppets portrayed a positive attitude to the literacy activity and the other a negative view (e.g., "Harry likes to read books by himself. Larry does not like to read books by himself"). The child was asked who they are most like ("Are you more like Harry or Larry?") and then whether they were "a little" or "a lot" like the puppet selected. This provided a 4-point response format regarding the literacy activity (1 = *dislikes a lot*, 2 = *dislikes a little*, 3 = *likes a little*, 4 = *likes a lot*). Baker and Scher argued that this format decreases a child's chance of providing a response in a socially desirable manner. Cronbach's alpha for the total motivation score (scored out of 36) was .64 at pre- and post- test and .66 at follow-up.

**Peabody Picture Vocabulary Test 4<sup>th</sup> Edition** (PPVT-IV; Dunn & Dunn, 2007). This measures receptive vocabulary and is normed for 2.5 to over 90 years of age. Children select one of four pictures that best represents a word spoken by the examiner. Dunn and Dunn (2007) reported split-half reliabilities of around .94.

**Home literacy questionnaire.** Parents completed this prior to the intervention. It was based on the questionnaire used by Hood, Conlon, and Andrews (2008). However, it included an additional section on home writing activities and resources and the use of environmental print (including what environmental print items the child was



familiar with; “Which signs or labels does your child know how to read?”). The home literacy questionnaire (see Appendix D) included demographic details about the child and family, questions about home literacy, and a Children’s Title Checklist (CTC; a children’s storybook title familiarity test). Home literacy items were responded to on a 6-point Likert-type response scale where 1 = *never* to 6 = *several times daily*. There were 5 items about shared storybook reading (e.g., How frequently does the child have a story book read to them?; Cronbach’s  $\alpha = .67$ ), 4 items about the direct use of environmental print (e.g., How often does the mother or family member point out environmental print letters?;  $\alpha = .82$ ), 4 items about writing (e.g., How frequently does your child do writing at home?;  $\alpha = .80$ ), 9 items about home literacy teaching (e.g., How often does a family member teach the names of letters in a typical week;  $\alpha = .92$ ), 8 items about home alphabet resources (e.g. alphabet chart;  $\alpha = .58$ ), and 7 items about writing activities (e.g., writing greeting cards;  $\alpha = .61$ ).

The Children’s Title Checklist assesses parents’ ability to correctly identify children’s storybook titles. This test is reported to reflect valid parent literacy behaviours and home literacy activities such as home reading and library and bookstore visits (Echols, West, Stanovich, & Zehr, 1996). The titles were those previously used by Hood et al. (2008) and were selected from Angus and Robertson Book World’s (2006) 100 all-time favourite children’s books on the basis that they were currently available in local bookstores and libraries and so likely to be familiar. Parents indicated which titles they recognized from a list of 20 real titles (e.g., “The Cat in the Hat”) and 10 foils (made up titles e.g., “Old Fox”). The score was the proportion of real titles minus the proportion of foils. This scoring technique prevents response bias.

## Materials

The intervention program and letters taught were identical in both the environmental print and standard print interventions. The program focussed on capital letters because upper-case letters are preferred in young preschoolers, possibly due to a ‘natural’ parental/carer focus on uppercase letters (Treiman, Levin, & Kessler, 2007). Furthermore, preschool children tend to learn upper-case letters first (Worden & Boettcher, 1990) partly because lower-case are more visually confusing and upper-case letters are commonly seen in the child’s environment (McCormick & Mason, 1981).

Environmental print labelled products were used for the environmental print intervention, whereas for the standard print intervention, the same words were printed in black upper-case century gothic font size 120 on 10 x 20 cm on white card (see Figure 1). The letters taught were taken from cereal box labels in the order that they appeared on the labels (MILO, FROOT LOOPS, CORN FLAKES, RICE BUBBLES, NUTRI-GRAIN; M, I, O; F, T, P; C, L, S; R, E, B; N, G, A). A range of other product labels and signs commonly found in the children’s local surroundings and identified as being known to the children in the parent questionnaire (or the same words in manuscript form for the standard print group) were also used to search for the focus letters during the activities (EXIT, LEGO, SUBWAY, STOP, PICNIC, MILK, PEPSI, COCO POPS, SMITHS, SNICKERS, VEGEMITE, HEINZ, POP TOPS, SUNBEAM, ARNOTT’S, UNCLE TOBYS, JUST JUICE, BERRI, SAMBOY, SOLO, KRAFT). During the letter writing activity, the instructor used a magnetic sketch board to model the letter shape and each child wrote the letters in their own blank-paged writing pad with a HB pencil.



Figure 1. An example of the print types used for each intervention group.

### **Environmental Print Intervention Program**

For each session, the children sat on the floor in front of the instructor who sat on a low chair. Each session lasted approximately 30 minutes. In the first 5 weeks of the program, three new letters were introduced per week using that week's cereal box (e.g., Week 1: M, I, O from MILO; Week 2: F, T, P from FROOT LOOPS; and so on in order until all 15 letters were presented).

In Week one, Activity 1 involved introducing the five cereal boxes to the children and learning 3 letters (M, I, O). In Weeks 2 to 5, Activity 1 involved revising all the letters learnt in the previous weeks with each child identifying each letter once using the point, say, move, and trace method described below. For example, in Week 3, the letters M, I, O, F, T, P would be revised before learning the 3 new letters (C, L, S). In the last 3 weeks, the fifteen letters were revised each week (in the same order as the initial teaching sessions). The 8 week intervention program is presented in Appendix E.

In weeks 1 to 5, Activity 2 consisted of a singing activity with actions to learn directional terms up, down, around, and across (e.g., *Hands go up, hands go down, shake your hands and turn around*, see Neumann, 2007). This directional language was

used to scaffold children's letter shaping when forming letters in the air, tracing them with fingers, and writing them on paper. Activity 3 focussed on identifying the letters embedded in the words. It used a multisensory strategy in which children interacted with each letter using their four senses; Look and Point (visual, Point to the M in MILO), Say the letter name and sound (auditory; e.g., "M for MILO makes a MMM sound"), Move (kinaesthetic, e.g., "M for MILO goes up, down, up, down – move your arm up and down in the sky), and Trace (tactile; trace the shape of the letter with a finger saying "up, down, up, down"). The instructor held the MILO box giving each child three turns at tracing each target letter.

In Activity 4, the instructor pointed out the target letters in other environmental print items using the 'point, say, move, trace' method and encouraged children to find these letters (e.g., M in MILK, VEGEMITE, and SUNBEAM). When pointing out vowels (A, E, I, O) the instructor used short vowel sounds (e.g., for the E in RICE BUBBLES; "its name is Eee and it makes a /e/ sound"), as the program's focus was on learning individual letters not word decoding.

Activity 5 was the letter writing activity. The instructor referred to the word on the cereal box (e.g., MILO) then modelled writing each target letter (e.g., M, I, O) on an upright magnetic sketch board using directional language, also referring to the letter name and sound (e.g., "M for MILO, its name is *Emm*, it makes a /m/ sound and goes up, down, up, down"). The children wrote the letter in the sky using directional language followed by writing it in their book with a pencil. The instructor scaffolded children's individual letter shaping by using the directional language and referring to the target letters in the environmental print word. In weeks 6 to 8, each revision session commenced with the singing activity followed by revision of the 15 letters using the 'point, say, move and trace' method, and then the writing activity (see Appendix E).

### **Standard Print Intervention Program**

The standard print program was presented in exactly the same manner as the environmental print program with the same letters taught. The only difference was the print type used (i.e., the same environmental print words in manuscript form).

### **Program Fidelity**

As the first author conducted all the intervention sessions, it was important to check for experimenter bias in the quality of instruction and adherence to the program. To determine instructor fidelity and program adherence across the two intervention groups, every session (80 sessions) was videotaped using a camera placed at the rear of the room. Twenty percent of the sessions were selected in a stratified random method so that two sessions were randomly sampled from each week from each type of intervention, giving a total of 16 sessions. An independent, trained, and experienced research assistant (a psychology graduate with no knowledge of the study's design or hypothesis) rated fidelity based on similar criteria to that used by Hamre et al. (2010) and Webster-Stratton, Reid, and Stoolmiller (2008). Hamre et al., (2010) had only used a simple checklist score of 1 for present or 0 for not present. To increase the sensitivity of this measure, a 4-point rating scale (1= *never* =, 2 = *sometimes*, 3 = *mostly*, 4= *always*) was used in the present study to score instructor's behaviour. The sessions were scored on (1) the number of positive reinforcements given (e.g., good job, yes!), (2) 10 items regarding the instructor behaviour during the session (e.g., uses clear and concise age-appropriate language) rated on the 4-point scale, and (3) 4 items regarding program adherence scored using the same 4-point scale (e.g., Instructor's language is in accordance with the program script; see Appendix F for the fidelity criteria). Independent samples *t*-tests showed no significant differences between the

environmental print and standard print conditions on any of these criteria for the delivery of the program or the instructor's behaviour (all  $ps > .05$ ).

## Results

### Pre-test Analyses

Table 1 shows the means and standard deviations for all measures at pre-test. All variables were normally distributed except letter sound knowledge and reading of words in standard print. These were unable to be transformed to normality. Therefore, they were analysed as categorical variables. Children's letter sound knowledge was coded as 0 = children who knew no letter sounds (environmental print  $n = 18$ , standard print  $n = 14$ , and control  $n = 18$ ) and 1 = children who knew at least one letter sound (environmental print  $n = 7$ , standard print  $n = 9$  and control  $n = 7$ ). Chi-square analysis indicated there was no significant relationship between group membership and letter sound knowledge,  $\chi^2(2, N = 73) = 0.90, p = .64$ . Table 2 shows the frequency of children's letter sound knowledge across groups.

Table 1

*Means, Standard Deviations, and Range for the two Intervention and Control Groups in all measures*

Variable	Pre-test (T1)			Post-test (T2)			Follow-up test (T3)		
	EP	SP	Control	EP	SP	Control	EP	Control	
Letter name	6.08 (7.40, 0-23)	3.74 (3.93, 0-12)	6.60 (6.81, 0-22)	10.88 (9.16, 0-26)	6.83 (6.43, 0-19)	9.12 (9.24, 0-25)	11.96 (9.38, 0-26)	8.43 (7.29, 0-24)	9.96 (9.54, 0-26)
Letter sound	0.32 (0.58, 0-2)	0.87 (1.29, 0-4)	1.04 (2.05, 0-7)	6.48 (5.32, 1-17)	4.87 (4.75, 0-16)	2.32 (3.44, 0-12)	7.16 (6.50, 0-20)	5.17 (4.78, 0-15)	2.84 (3.91, 0-11)
Letter writing	2.00 (2.02, 0-7)	1.00 (1.71, 0-6)	1.08 (1.22, 0-4)	4.36 (2.68, 0-14)	3.61 (2.50, 0-10)	2.08 (1.78, 0-6)	5.12 (2.17, 2-9)	3.17 (2.74, 0-10)	1.96 (2.25, 0-7)
Print concepts	4.92 (1.58, 1-8)	5.00 (2.0, 2-9)	5.36 (2.12, 2-10)	6.80 (1.80, 4-9)	6.43 (1.70, 4-9)	5.32 (2.19, 3-10)	6.64 (2.33, 2-10)	5.87 (2.51, 2-9)	5.20 (2.06, 2-9)
EP word reading	8.72 (3.10, 0-13)	6.78 (3.69, 0-11)	8.36 (3.41, 0-14)	13.76 (3.79, 5-19)	9.09 (3.67, 2-15)	7.84 (3.71, 0-16)	13.24 (3.46, 6-19)	9.26 (2.73, 4-14)	8.88 (3.53, 2-14)
SP word reading	0.08 (0.28, 0-1)	0.00 (0.00, 0-0)	0.00 (0.00, 0-0)	0.68 (0.95, 0-3)	0.87 (0.92, 0-3)	0.00 (0.00, 0-0)	0.68 (0.99, 0-3)	0.22 (0.52, 0-2)	0.12 (0.33, 0-1)
Print motivation	28.16 (5.14, 18-36)	26.39 (4.37, 18-35)	28.44 (5.29, 14-36)	30.60 (3.89, 23-36)	27.78 (4.52, 20-36)	27.16 (1.14, 18-36)	30.60 (3.73, 22-36)	24.39 (5.46, 12-36)	25.08 (4.88, 18-36)
Receptive vocabulary	102.48 (10.12, 88-127)	101.87 (10.67, 83-129)	99.08 (9.43, 83-120)						
Home reading	16.56 (2.97, 11-22)	16.45 (4.60, 9-25)	17.52 (4.76, 7-25)						
CTC	41.80 (19.09, 5-75)	42.05 (14.69, 5-65)	43.20 (16.89, 15-80)						
Home EP use	13.92 (4.83, 4-22)	13.27 (5.53, 4-23)	13.08 (5.31, 4-23)						
Home writing	12.63 (4.27, 4-21)	12.43 (4.31, 5-21)	14.36 (5.43, 4-23)						
Writing activities	3.24 (1.56, 0-6)	3.18 (1.82, 0-7)	2.88 (1.64, 0-7)						
Alphabet resources	4.44 (1.71, 1-7)	4.73 (2.05, 1-8)	4.44 (1.98, 2-8)						
Home literacy teaching	35.54 (7.72, 13-45)	34.95 (10.31, 15-49)	34.46 (11.38, 9-52)						

*Note.* EP = Environmental print group; SP = Standard print group; C = Control group; Pre-test (T1) = immediately before intervention; Post-test (T2) = immediately after intervention; Follow-up test (T3) = 8 weeks after intervention; CTC = Children's title checklist.

Table 2

*Frequency Distribution Table of Letter Sound Knowledge across the Groups prior to the Intervention (Pre-test)*

Letter Sound Knowledge	EP	SP	C
0	18	14	18
1	6	3	1
2	1	2	2
3	0	3	1
4	0	1	0
5	0	0	1
6	0	0	1
7	0	0	1

*Note:* EP = Environmental Print, SP = Standard Print, C = Control (no literacy intervention)

Children's reading of standard print words was at floor and coded as 0 = children who knew no words and 1 = children who knew at least one word. At pre-test only two children in the environmental print group could read one word (STOP) and no children in the standard print or control group could read any words in standard print. Therefore the children could be generally classified as non-readers. Chi-square analysis indicated there was no significant relationship between group membership and standard print reading at pre-test,  $\chi^2 (2, N = 73) = 3.95, p = .14$ .

One-way ANOVAs were used to check if the groups differed on any other emergent literacy measures (letter name knowledge, print concepts, letter writing, print motivation, environmental print word reading) at pre-test. There were no significant group differences on any of these measures (see Table 3).



Table 3

*One-way ANOVA Pre-tests of Environmental Print, Standard Print and Control Groups*

Variable	<i>F</i> (2, 70)	<i>p</i>
Letter name	0.75	.48
Letter writing	2.89	.06
Print concepts	0.37	.69
EP word reading	2.17	.12
Print motivation	1.18	.31
Receptive vocabulary	0.81	.45
Home reading	0.48	.62
CTC	0.05	.95
Home EP use	0.17	.84
Home writing	0.31	.73
Writing activities	0.33	.72
Alphabet resources	0.17	.84
Home literacy teaching	0.72	.49
SES	0.45	.64
Child age	2.87	.06

Note: EP= Environmental print, CTC = Children's title checklist, SES=Socio-economic status

In order to ensure the groups were equivalent on demographic factors of SES and child age and home literacy environment measures (home reading, Children's Title Checklist, environmental print use, home writing, writing activities, alphabet resources, and literacy teaching) at pre-test, one-way between-groups ANOVAs were also conducted. There were no significant differences between the groups on any of these measures (see Table 3). A chi-square test indicated no significant relationship between gender and group membership  $\chi^2 (2, N = 73) = 0.46, p = .80$ .

To determine whether there were any significant differences in weekly program attendance between the two intervention groups, an independent samples *t*-test was conducted. Attendance did not differ and was high in both the environmental print group ( $M = 7.08; SD = 1.15$ ) and the standard print group ( $M = 7.09, SD = 1.08$ ),  $t (46) = 0.02, p = .98$ .

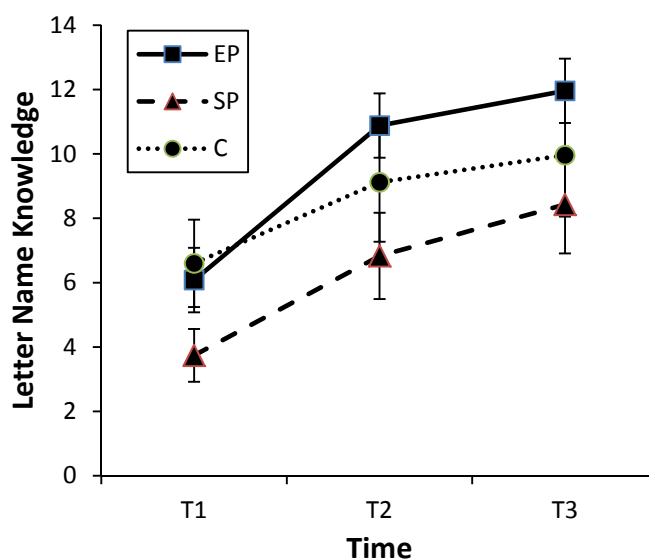
### Intervention Analyses

A mixed factorial multivariate analysis of variance (MANOVA) was used to examine the overall effects of group on emergent literacy over the three test times (pre-test, post-test, 2 month follow-up). The only dependent variables that were significantly correlated were letter name, letter sound, letter writing, and print concepts so these were the only dependent variables included in the MANOVA. Due to violations of the assumptions of homogeneity of variance and equality of the covariance matrices, Pillai's trace was interpreted because it is more robust to those violations than Wilk's lambda. There were significant multivariate main effects of group,  $F(8, 136) = 3.72, p = .001, \eta_p^2 = .18$  and time,  $F(8, 63) = 19.96, p < .001, \eta_p^2 = .72$ . There was also a significant multivariate Time x Group interaction,  $F(16, 128) = 2.44, p = .003, \eta_p^2 = .23$ .

In order to interpret this significant multivariate interaction effect, the univariate main effects were examined. Separate 3 (Time) x 3 (Group) mixed factorial ANOVAs were conducted for each dependent variable. To correct for potentially inflated Type 1 error rate with these multiple univariate comparisons, a more conservative alpha of .013 was used. Assumptions of equality of covariance matrices, sphericity, and homogeneity of variances were met for all analyses except for those with letter sound knowledge and reading of words in standard print as the dependent variables. With letter sound knowledge, a more conservative  $\alpha$  level of .01 was used to correct for the possibility of inflated Type 1 error rate due to inequality of the covariance matrices. To overcome the sphericity violation, the Huynh-Feldt correction ( $\epsilon = .68$ ) to the degrees of freedom was used to account for the possibility of inflated Type 1 error. There was heterogeneity among the variances. However, the F max ratio (largest to smallest variance) was only 3.33:1. Tabachnick and Fidell (2007) argued that F max ratios up to 10:1 provide

adequate homogeneity of variance for mixed ANOVA. Therefore, no adjustment was made for this. The violations to these assumptions were too severe to conduct parametric analysis with standard print word reading; therefore, the non-parametric Kruskal-Wallis analysis was used. Following the MANOVA a more conservative alpha level was used for the univariate analyses based on  $.05/6$  (number of dependent variables) =  $.008$ . To determine effect sizes,  $\eta_p^2$  was reported for overall interactions and  $\eta^2$  and Cohen's  $d$  calculated for simple effects analysis.

A significant main effect of time was found for letter name knowledge  $F(2, 70) = 62.56, p < .001, \eta_p^2 = .47$  indicating that letter name knowledge improved over time (see Figure 2). There were no other significant effects involving letter name knowledge.



*Figure 2.* The mean letter name knowledge for environmental print (EP), standard print (SP), and control (C) group at pre-intervention (T1), post-intervention (T2) and 2 month follow-up (T3). Error bars represent standard errors.

Significant main effects involving the other dependent variables need to be interpreted in terms of significant Time x Group interactions also involving those variables. There were significant main effects of time on letter sound knowledge  $F(2, 70) = 58.60, p < .001, \eta_p^2 = .46$ , letter writing  $F(2, 70) = 48.71, p < .001, \eta_p^2 = .41$ , print concepts  $F(2, 70) = 12.02, p < .001, \eta_p^2 = .15$ , environmental print word reading  $F(2, 70) = 27.10, p < .001, \eta_p^2 = .30$ , and print motivation  $F(2, 70) = 4.54, p = .012, \eta_p^2 = .061$ . Significant main effects of group were found for letter writing  $F(2, 70) = 8.61, p < .001, \eta_p^2 = .20$ , environmental print word reading  $F(2, 70) = 11.96, p < .001, \eta_p^2 = .26$ , and print motivation  $F(2, 70) = 6.18, p = .003, \eta_p^2 = .15$ . There was no significant main effect of group on letter sound knowledge  $F(2, 70) = 3.54, p = .034$ .

In order to further interpret the significant interaction effects involving these variables, simple effects analyses of group at each time were conducted using one-way ANOVAs, followed by the Ryan-Einot-Gabriel-Welsch post-hoc tests to determine which groups differed for any significant simple effects. Group differences at pre-test were already reported in the pre-test analyses. As there were no significant differences between groups at pre-test, the simple effects analyses focused on group differences at post-intervention and follow-up. Results for each dependent variable are presented below.

### **Letter sound knowledge**

Figure 3 shows the significant Time x Group interaction,  $F(2, 70) = 7.44, p < .001, \eta_p^2 = .18$ . Simple effects analyses showed significant effects of group at post-test,  $F(2, 70) = 5.27, p = .007, \eta_p^2 = .13$  but this failed to reach significance at follow-up test,  $F(2, 70) = 4.34, p = .017$ . Post hoc tests indicated that the environmental print group scored significantly higher than the control group at post-test ( $d = 0.93$ ) and at follow-

up test ( $d = 0.87$ ), but did not differ to the standard print group at either time. Also no significant differences were found between the standard print and control group at post or follow-up test times.

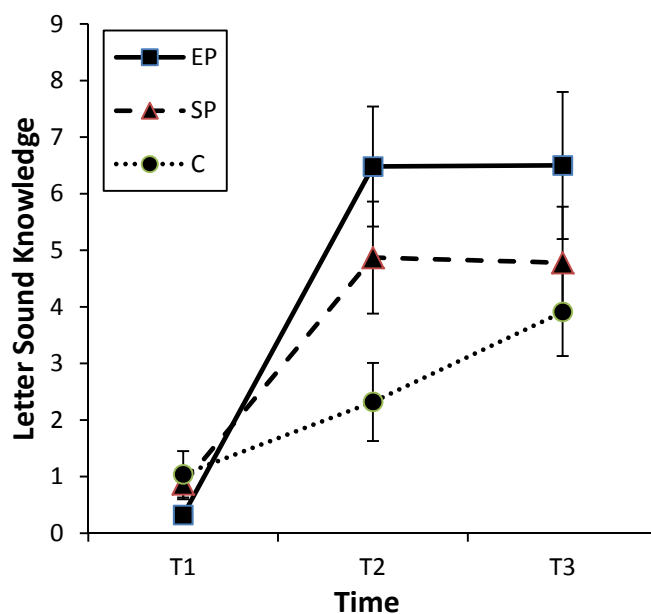
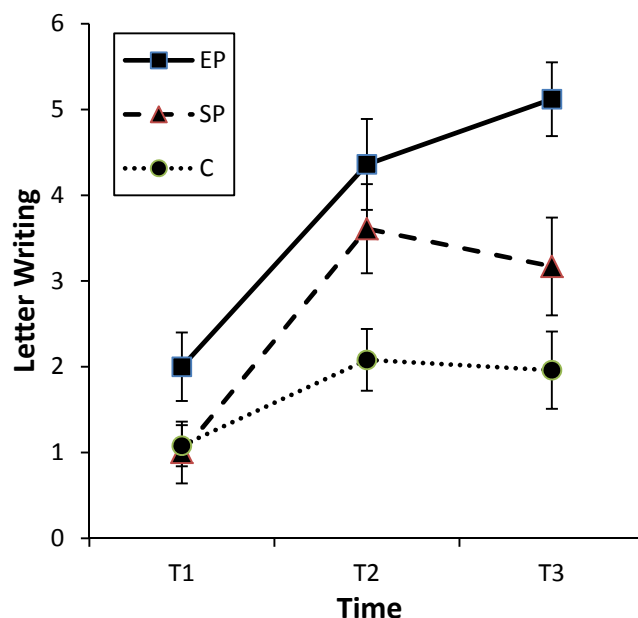


Figure 3. The mean letter sound knowledge for environmental print (EP), standard print (SP), and control (C) group at pre-intervention (T1), post-intervention (T2), and 2 month follow-up (T3). Error bars represent standard errors.

### Letter writing

The Time x Group interaction was significant,  $F(2, 70) = 4.78, p = .001, \eta_p^2 = .12$  (see Figure 4). There were significant simple effects of group at post-test,  $F(2, 70) = 6.12, p = .004, \eta^2 = .15$ . The environmental print group ( $d = 1.00$ ) wrote significantly more letters than the control group but did not differ from the standard print group at post-test. However, at follow-up test, the environmental print group wrote significantly more letters than both the standard print group ( $d = 0.79$ ) and the control group ( $d = 1.43$ ),  $F(2, 70) = 11.14, p < .001, \eta^2 = .24$ . At post-test, the standard print group ( $d =$

0.72) wrote significantly more letters than the control group but did not differ significantly from the control group at follow-up test.



*Figure 4.* The mean letter writing for environmental print (EP), standard print (SP), and control (C) group at pre-intervention (T1), post-intervention (T2) and 2 month follow-up (T3). Error bars represent standard errors.

### **Print concepts**

The significant Time x Group interaction,  $F(2, 70) = 4.17, p = .004, \eta_p^2 = .11$ , is shown in Figure 5. At post-test, the environmental print group scored significantly higher than the control group ( $d = 0.74$ ),  $F(2, 70) = 4.03, p = .022, \eta^2 = .10$ , but not the standard print group. The standard print group did not differ significantly from the control group at post-test and there were no significant differences between any of the three groups at follow-up test.

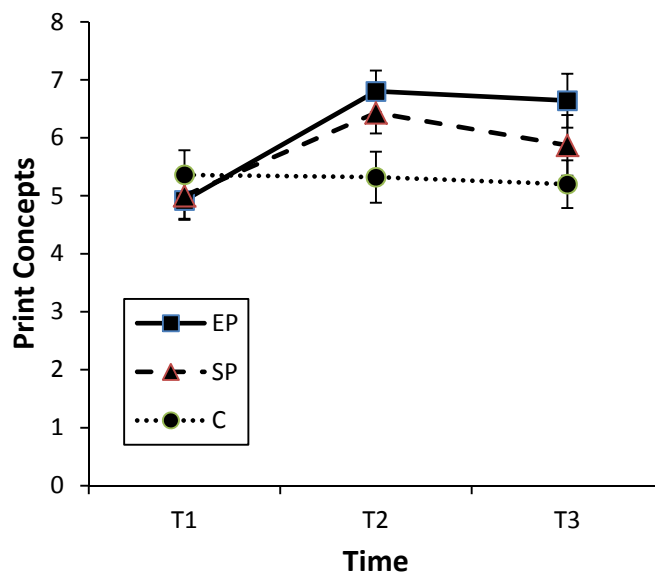
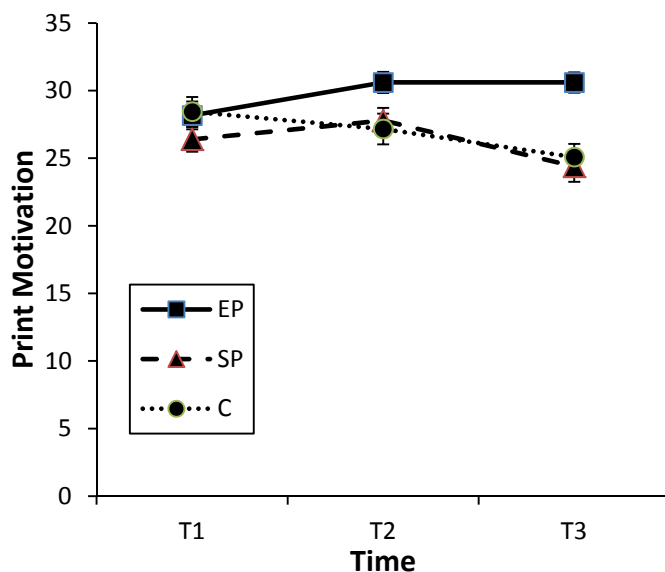


Figure 5. The mean print concepts for environmental print (EP), standard print (SP), and control (C) group at pre-intervention (T1), post-intervention (T2) and 2 month follow-up (T3). Error bars represent standard errors.

### Print motivation

Figure 6 shows this significant interaction,  $F(2, 70) = 4.88, p = .001, \eta_p^2 = .12$ . At post-test, the environmental print group had significantly higher print motivation than the standard print ( $d = 0.67$ ) and control ( $d = 0.70$ ) groups,  $F(2, 70) = 3.65, p = .03, \eta^2 = .09$ . At follow-up test, these gains were sustained, with the environmental print group showing significantly higher print motivation than the standard print ( $d = 1.33$ ) and control ( $d = 1.27$ ) groups,  $F(2, 70) = 12.71, p < .001, \eta^2 = .27$ . The standard print and control group did not differ significantly at post or follow-up test.



*Figure 6.* The mean print motivation for environmental print (EP), standard print (SP), and control (C) group at pre-intervention (T1), post-intervention (T2) and 2 month follow-up (T3). Error bars represent standard errors.

### **Environmental print reading**

Figure 7 shows the significant Time x Group interaction,  $F(2, 70) = 9.97, p < .001, \eta_p^2 = .22$ . At post-test, the environmental print group had significantly higher environmental print word reading than the standard print ( $d = 1.25$ ) and control ( $d = 1.58$ ) groups,  $F(2, 70) = 17.48, p < .001, \eta^2 = .33$ . At follow-up test, these gains were sustained. The environmental print group scored significantly higher than the standard print ( $d = 1.28$ ) and control ( $d = 1.25$ ) groups,  $F(2, 70) = 13.48, p < .001, \eta^2 = .28$ . The standard print and control group did not differ significantly at post or follow-up test.



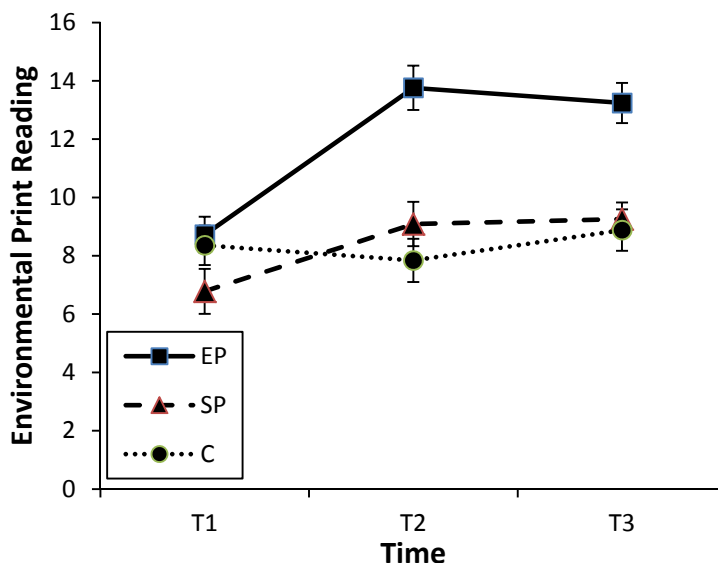
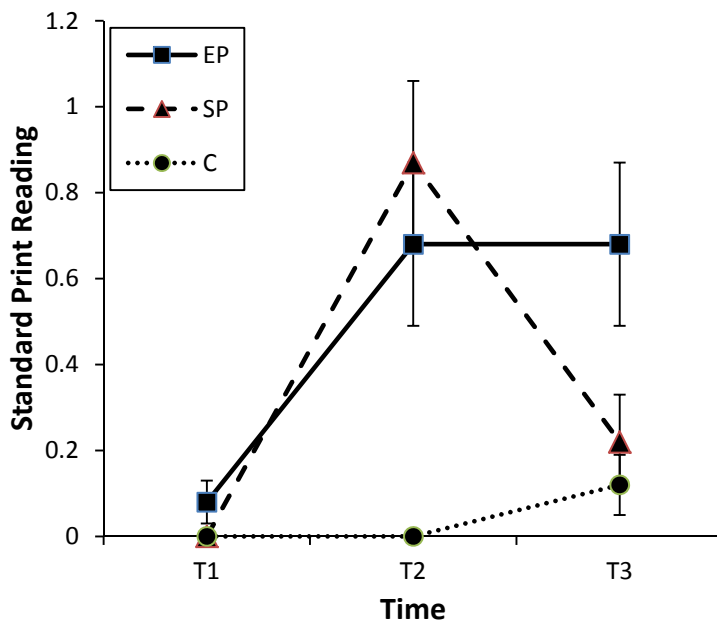


Figure 7. The mean environmental print reading for environmental print (EP), standard print (SP), and control (C) group at pre-intervention (T1), post-intervention (T2) and 2 month follow-up (T3). Error bars represent standard errors.

### Standard print reading

This was analysed using the Kruskal Wallis test at post-test and follow-up test due to violations of parametric test assumptions. There were significant differences between groups in standard print word reading at post-test (Mean Ranks = 40.46, 45.74, 25.50 for environmental print, standard print, and control groups, respectively),  $H(2, N = 73) = 17.70$ ,  $p < .001$ , and follow-up test (Mean Ranks = 43.64, 34.65, 32.52, respectively),  $H(2, N = 73) = 7.05$ ,  $p = .029$  (see Figure 8). Post-hoc Wilcoxon signed-rank tests showed that the environmental print and standard print groups did not significantly differ at post-test,  $p = .385$ , or follow-up test,  $p = .067$ . However, the environmental print group was ranked significantly higher than the control group at post-test,  $Z = -3.48$ ,  $p = .001$ , and follow-up,  $Z = -2.40$ ,  $p = .016$ . In contrast, the standard print group only differed significantly from the control group at post-test,  $Z = -4.3$ ,  $p < .001$ , but not at follow-up,  $p = .567$ .



*Figure 8.* The standard print reading for environmental print (EP), standard print (SP), and control (C) group at pre-intervention (T1), post-intervention (T2) and 2 month follow-up (T3). Error bars represent standard errors.

### Discussion

This paper reported a randomised, controlled intervention study that evaluated the effects of using environmental print in context compared to standard print (the same labels in manuscript form) and a no intervention control on young children's emergent literacy and print motivation. Overall, using environmental print was more effective than using standard print or no intervention in enhancing environmental print word reading and print motivation. The environmental print group also outperformed the no-intervention control on letter writing, letter sound knowledge, standard print reading, and print concepts, and sustained their gains two months later. The moderate to large effect sizes indicate practical relevance. In contrast, the standard print group only outperformed the control on letter writing and standard print word reading at post-intervention and did not sustain these differences at the 2-month follow-up. These

findings support the use of environmental print in early childhood settings to foster emergent literacy and print motivation.

The results support previous research showing that intervention using environmental print benefits emergent literacy (Prior, 2003; Salewski, 1995; Vera, 2007; Wepner, 1985). However, the present study extended that previous work by using a more rigorous randomised control design and examining the effects of environmental print use on a broader range of emergent literacy skills. We also used a standard print comparison group to ascertain whether the colourful unique appearance of environmental print helps or hinders young children's learning of print. The environmental print group outperformed the standard print group on environmental print reading and print motivation at both post- and follow-up tests, and on letter writing at follow-up test. Although both intervention groups performed similarly, and better than the control, on standard print word reading and letter writing at post-test, the environmental print group sustained those gains at follow-up, whereas by follow-up the standard print group no longer differed to control. Furthermore, whereas the environmental print and standard print groups did not differ on print concepts at post-test and letter sound knowledge at both post-tests, only the environmental print group was significantly better than no intervention. Overall, these findings indicate that environmental print with its colourful appearance and logos facilitated learning and conferred advantages over using standard print.

As expected, the environmental print group showed significantly higher print motivation post-intervention than the other two groups. The colourful and salient nature of environmental print is more engaging and meaningful than words printed on cards in manuscript form and it is likely that this produced this difference in print motivation. This is consistent with Wepner's (1985) assertion that the attention grabbing nature of

environmental print benefits children's interest in print. Print motivation is an important component of emergent literacy because it reflects children's interest in print related activities (Whitehurst & Lonigan, 1998). Print motivation prior to school entry is likely to influence how a child approaches formal literacy activities, specifically, their reading motivation, which, in turn, influences their future literacy skills (Baker et al., 1997).

Possibly, encouraging children to interact with colourful and meaningful environmental print in context rather than in manuscript form also provided them with the motivation to seek it out and remember it. This in turn may have motivated them to identify this print in their broader contexts, for example when grocery shopping with parents. Consistent with this suggestion, it was observed informally that the personally meaningful nature of environmental print provided opportunities for children to initiate discussions with the instructor and each other. Children in the environmental print group spontaneously shared experiences where they had found target letters from the previous week's session in environmental print at the grocery store or at breakfast time. Also children pointed out letters other than the training letters on environmental print products during the sessions (e.g., the K in CORNFLAKES). They also pointed to and asked questions about letters and words on signs and posters as they walked back to their preschool rooms after each session. In contrast, these types of interactions were not observed in the standard print group. Although this evidence is anecdotal, it suggests that children's guided attention to environmental print letters during the sessions was transferred to environmental print they discovered outside the session and that it is possible that they extended this to their home and wider environments as well. The colourful, meaningful, and readily available nature of environmental print may have motivated further exploration it. It is also likely that this additional exploration afforded

by the ubiquity of environmental print in their broader environments accounted for the sustained gains found in the environmental print group over the other groups.

This study also extended current knowledge on fostering emergent writing, which is an important component of emergent literacy (Aram & Biron, 2004; Molfese et al., 2006; Ritchey, 2008). Environmental print use was more effective in enhancing letter writing over the long term. While both the standard print and environmental print groups wrote more letters post-intervention than the control group, only the environmental print group sustained this advantage two months later. This indicates that environmental print is an effective tool to scaffold letter writing in young children. Although speculative, it is possible that the sustained effects of the environmental print intervention reflected children's ability to access letters in environmental print during their daily lives to assist their letter writing. Children's emergent writing could also benefit further if they were encouraged to write words using environmental print (e.g., stop, exit). These results also provide empirical support for the descriptions reported in existing case studies of young children using environmental print words and letters to help them write (Baghban, 1984; Chan et al., 2008; Neumann et al., 2009; Neumann & Neumann, 2010).

Vera (2007) found an effect on letter knowledge but it was unclear if this included sounds as well as names. We examined both. The environmental print group had greater growth in letter sound knowledge than the no intervention control group. However, there was no significant difference between the environmental print or standard print groups. Thus, we cannot conclude that using environmental print is better than using standard print for enhancing letter sound knowledge, although only environmental print was better than no intervention, suggesting some benefit in using environmental print over standard print. Letter sound knowledge is important for

developing decoding skills (e.g., Treiman, Tincoff, Rodriguez, Mouzaki, Francis, 1998) and is a strong predictor of future word reading (e.g., Adams, 1990; Snow et al., 1998). Therefore, we have demonstrated an effective mechanism for developing this skill in preschool.

None of the groups differed significantly on letter name knowledge, which was unexpected. Lomax and McGee (1987) showed a relationship between environmental print knowledge and letter naming. To understand our unexpected null result better, we examined whether the groups differed on knowledge of the names of the 15 letters specifically taught during the intervention, but they did not. Our lack of significant group differences on letter name knowledge is consistent with Piasta, Purpura, and Wagner (2010). They compared the effects of letter name plus sound training with letter sound only training and a treated control group (number training). This study had similar sized training groups to our study (3 to 5 children) and a similar duration (8 weeks) but they trained all 26 upper case letters at the rate of one letter per lesson followed by 8 review lessons. Like our study, they found that letter name knowledge increased significantly over time for all groups with no significant between-group differences. They concluded that children's exposure to letter names at home and in their preschools may have contributed to not finding any additional effects of their interventions. Data from our home literacy questionnaire showed that our groups did not differ on the frequency with which parents taught letters to the children. On average, parents reported only teaching children letter names once a week, which was a similar rate to our intervention, so it is unclear whether that could explain our lack of between-group differences at post-testing.

Another potential explanation for why we found an effect on letter sounds but not names is that letter names are easier for children to learn on their own because by 3

years of age they are accustomed to using words to name things and letter names are often words in English (e.g., B = “bee”, T = “tea”; Share, 2004). In contrast, letter sounds are more challenging because children must link symbols with discrete sounds and isolate single phonemes, which requires explicit instruction (Levin et al., 2006; McBride-Chang, 1999). Being more easily acquired, letter name knowledge has been found to predict and support letter sound acquisition as letter names also contain their sounds (e.g., P = /p/ee) (McBride-Chang, 1999; Stuart & Coltheart, 1988; Treiman et al., 1998). Letter name knowledge also assists teacher and child communication about letters when learning sounds (Groff, 1984). Thus, even though our findings show no effect on letter naming, teaching letter names may be critical to supporting the gains found in letter sound knowledge from the intervention.

Like previous studies (Prior, 2003; Salewski, 1995; Wepner, 1985), the environmental print intervention resulted in better environmental print reading than no intervention. This supports Whitehurst and Lonigan’s (1998) view that environmental print reading is an important component of emergent literacy because it provides evidence that children have developed the ability to derive meaning from print in context. More importantly, our results showed that the environmental print intervention group could transfer that to reading the words in standard print to some extent. Previous studies have suggested that environmental print does little to promote word reading as young children focus on the contextual cues rather than the print (e.g., Ehri & Roberts, 2006; Masonheimer et al., 1984). Using either print type had a similar effect on learning to identify words in standard print. However, the environmental print group sustained its standard print word reading gains two months after the intervention whereas the standard print group did not. This suggests that the colourful visual cues of

environmental print logos did not distract children from examining the print itself and actually enhanced and sustained learning.

These findings are in accord with those of Cronin et al. (1999), who showed that non-reading 4- to 5-year-olds could learn environmental print words when presented in standard print form more quickly if they could already recognize the environmental print word in context (i.e., logographic reading). Our results go further in showing that simply teaching words in environmental print will translate to recognition in standard print format. While the mechanism underpinning this effect remains to be determined, it does indicate that environmental print can play an important role in early reading development when explicit instruction regarding letters in that print is used. Training the children to attend to and focus on letters embedded in the product logos supported word learning. Indeed, others have previously suggested that environmental print may be a useful teaching tool if children are trained to attend to letters and words embedded in the environmental print logos rather than just examining the print or words as a whole (Adams, 1990; Blair & Savage, 2006; Reutzal, Fawson, Young, Morrison, & Wilcox, 2003). However, the present findings must be interpreted cautiously as only a small percentage of children in each group could read words in standard print following the intervention. It is also possible that when reading the words in standard print, children were still using salient visual cues (e.g., the shape of the initial letter) rather than using grapho-phonemic connections.

Our results regarding the effect of using environmental print to develop print concepts was similar to that found in previous studies (Vera, 2007; Wepner, 1985). The environmental print intervention enhanced print concepts immediately following the intervention compared to the control group. The standard print group did not differ to the control group. However, these gains were short-lived and were not sustained at the



2-month follow-up. This highlights the importance of including longer term follow-up testing in these intervention studies. In order to sustain gains in print concepts, it may be necessary to extend the length of the program. Simply focussing on letters in words may not be ideal for fostering print concepts. The interventions that fostered print concepts also involved making logo books and other book handling skills and those activities may be most suited to fostering print concepts over the longer term (Vera, 2007; Wepner, 1985).

Our findings strengthen the view that environmental print can play a role in fostering emergent literacy and print motivation during the pre-alphabetic phase when children typically rely on visual cues to derive meaning from print (e.g., Bowman & Treiman, 2004; Mason, 1980; McGee & Richgels, 1989; Whitehurst & Lonigan, 1998). The effectiveness of using environmental print to facilitate children's movement towards the partial alphabetic phase may be dependent upon how environmental print is used to scaffold children's learning. In the present study, the same multisensory activities were used help children interact with letters embedded in the environmental print or standard print. It is possible that these activities (i.e., point, say, move, trace) contributed to the positive and sustained outcomes; for example, by improving memory or fine motor skills for linking letter shapes to sounds or physically writing letters (Birsh, 2006; Henry & Hook, 2006; Moats & Farrell, 2005). Multisensory teaching approaches have been found to benefit early literacy skill acquisition in the preschool setting (Bara et al 2004; Zafrana et al., 2000). Therefore, future research needs to examine whether this environmental print intervention would be equally effective in scaffolding emergent literacy without the use of multisensory teaching. Reading already involves auditory and visual stimulation and integration. The question is to what extent

the additional tactile and kinaesthetic components explained the improvements seen in emergent literacy, regardless of print type used.

The important and novel findings in the present study raise several other issues that need to be followed up in future research. Although the program used in the present study was of relatively short duration, 30 minutes for 8 weeks, moderate effect sizes and positive outcomes were found and in many cases were sustained 2-months post intervention. However, it would be worthwhile extending the duration to determine whether this further facilitates movement from the pre-alphabetic to partial alphabetic phase.

The main researcher delivered the current intervention. Fidelity was assessed and indicated no evidence of experimenter bias. However, future research needs to determine the effectiveness of normal classroom teachers delivering this program. Embedding these strategies using environmental print in the regular preschool classroom would also enable the duration to be extended as teachers would be able to draw children's attention to letters in environmental print as opportunities arose throughout the day, such as when children had lunch boxes with colourful logos on them. Given our observations of how this lead to children initiating their own exploration of letters in surrounding print, it is likely they would extend these activities more themselves.

The present environmental print program did not explicitly encourage children to sound out the words, but rather focused on teaching the sounds of isolated letters identified in the words in the environmental print. Extending this to listening to the sounds of letters in the words may have the potential to propel children towards the partial alphabetic phase where graphophonemic cues are used to read words. It also may

be beneficial in future studies to measure the effect of environmental print use on phonological skills. Phonological awareness is a strong predictor of future reading ability (e.g., Snow et al., 1998) and establishing whether phonological awareness can be developed using environmental print would be useful.

The effectiveness of the environmental print program delivered by parents in the home setting also needs to be examined. The simple method of using this readily available and cost effective literacy resource has the potential to be implemented easily by parents. Case studies have already described parents utilising environmental print to support children's literacy skill development (e.g., Lass, 1982; McGee & Richgels, 1989). Parents play a key role in supporting emergent literacy development in the home environment (Haney & Hill, 2004; Hood et al., 2008; Purcell-Gates, 1996; Roberts, Jurgens, & Burchinal, 2005; Saracho, 1997; Wood, 2002). Explicit teaching by parents fosters letter knowledge but storybook reading does not (Evans, Shaw, & Bell, 2000; Hood et al., 2008; Sénéchal & Le Fevre, 2002; Sénéchal, Le Fevre, Thomas, & Daley, 1998). Therefore, encouraging or training parents to teach using letters and words in environmental print may be an effective means to promote emergent literacy and print motivation in the home environment. Referencing of letters and words embedded in environmental print at home is likely to be a fun, meaningful, and practical way of interacting with elements of print for young children.

Extending this environmental print program to the home setting could potentially benefit families from a range of SES backgrounds and literacy levels in fostering emergent literacy skills. Parents with low literacy levels who find it difficult to read storybooks may feel more competent using easily identified environmental print to point out letters and words to their children. Further work is needed to determine whether children from low SES or low literacy backgrounds where there are fewer

formal literacy resources (e.g., storybooks) in the home but similar access to environmental print would show similar gains to children from middle SES families. The case studies where parents incorporated environmental print strategies in the home (Neumann et al., 2009; Neumann & Neumann, 2010) were within highly literate middle SES families. Further research is needed to validate the benefits of a home-based environmental print program in a broad range of families.

In conclusion, the present study has shown that environmental print can be used to enhance and sustain gains in a broad range of emergent literacy skills. Environmental print also increased children's print motivation, which is likely to result in ongoing gains as children orient to and enjoy reading letters and words in surrounding print. By helping children interact with letters and words in environmental print in a more focused manner, they may initiate further exploration of it in their broader contexts utilising these strategies. Future research needs to determine if similar effectiveness can be achieved with this approach used by preschool classroom teachers and by parents in the home environment.

#### **Notes**

This article includes a word or words, logos, or brands, that is, or is asserted to be, a propriety term or trademark. All trademarks remain property of their respective holders, and are used only to directly describe the products. Inclusion does not imply it has acquired for legal purposes a non-propriety or general significance, nor is any other judgement implied concerning its legal status.

## References

- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge: MIT press.
- Angus and Robertson Bookworld. (2006). Angus and Robertson's 100 all-time favourite children's books. <http://www.bookworld.com.au/kidstop1002.htm>
- Aram D., & Biron, S. (2004). Joint storybook reading and joint-writing interventions among low SES preschoolers: differential contributions to early literacy. *Early Childhood Research Quarterly, 19*, 588-610.
- Australian Government (2005). *National inquiry into the teaching of literacy: Teaching reading, report and recommendations* (Publication No. 0 642 77577 X). Canberra, Australian Capital Territory: Author.
- Baghban, M. (1984). *Our daughter learns to read and write: A case study from birth to three*. International Reading Association: Newark Delaware.
- Baker, L., Scher, D., & Mackler, K. (1997). Home and family influences on motivations for reading. *Educational Psychologist, 32*, 69-82.
- Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology, 23*, 239-269.
- Bara, F., Gentaz, E., Cole, P., & Sprenger-Charolles, L. (2004). The visuo-haptic and haptic exploration of letters increases the kindergarten-children's understanding of the alphabetic principle. *Cognitive Development, 19*, 433-449.

- Bastien-Toniazzo, M., & Jullien, S. (2001). Nature and importance of the logographic phase in learning to read. *Reading and Writing: An Interdisciplinary Journal*, *14*, 119-143.
- Birsh, J. R. (2006). What is multisensory structured language? *Perspectives: The International Dyslexia Association*, *32*, 15-20.
- Blair, R., & Savage, R. (2006). Name writing but not environmental print recognition is related to letter-sound knowledge and phonological awareness in pre-readers. *Reading and Writing*, *19*, 991-1016.
- Bloodgood, J. W. (1999). What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly*, *34*, 342-367.
- Bowman, M. & Treiman, R. (2004). Stepping stones to reading. *Theory into Practice*, *43*, 295-303.
- Chan, L., Zi Juan, C., & Lai Foon, C. (2008). Chinese preschool children's literacy development: from emergent to conventional writing. *Early Years*, *28*, 135-148.
- Clay, M. M. (1975). *What did I write? Beginning writing behaviour*. Auckland: Heinemann.
- Clay, M. M. (1979). *The early detection of reading difficulties*. Portsmouth, NH: Heinemann.
- Clay, M. M. (1998). *By different paths to common outcomes*. Maine: Stenhouse.
- Clay, M. M. (2005). *An observation survey of early literacy development*. Auckland: Heinemann.
- Clay, M. M. (2008). *Sand*. Rosedale, Northshore: Pearson.

- Cloer, T., Aldridge, J., & Dean, R. M. (1981/1982). Examining different levels of print awareness. *Journal of Language Experience*, 4, 25-33.
- Cronin, V., Farrell, D., & Delaney, M. (1999). Environmental print and word reading. *Journal of Research in Reading*, 22, 271-282.
- Dickinson, D. K., & Snow, C. E. (1987). Interrelationships among prereading and oral language skills in kindergarteners from two social classes. *Early Childhood Research Quarterly*, 2, 1-25.
- Dunn, L. M., & Dunn, D. M. (2007). *The Peabody Picture Vocabulary Test* (4<sup>th</sup> ed.). Bloomington, MN: NCS Pearson, Inc.
- Echols, L. D., West, R. F., Stanovich, K. E., & Zehr, K. S. (1996). Using children's literacy activities to predict growth in verbal cognitive skills: A longitudinal investigation. *Journal of Educational Psychology*, 88, 296 – 304.
- Ehri, L. C. (1995). Phases of development in learning to read words by sight. *Journal of Research in Reading*, 18, 116-125.
- Ehri, L. C. (2005). Learning to read words: theory, findings and issues. *Scientific Studies of Reading*, 9, 167-188.
- Ehri, L. C., & Roberts, T. (2006). The roots of learning to read and write: Acquisition of letters and phonemic awareness. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research: Vol. 2.* (pp. 113-130). New York, NY: Guildford Press.
- Ehri, L. C., & Wilce, L. S. (1985). Movement into reading: Is the first stage of printed word reading visual or phonetic? *Reading Research Quarterly*, 20, 163-179.

- Elliot, E. M., & Olliff, C. B. (2008). Developmentally appropriate emergent literacy activities for young children: adapting the early literacy and learning model. *Early Childhood Education Journal*, *35*, 551-556.
- Enz, B. J., Prior, J., Gerard, M. R., & Han, M. (2008). Exploring intentional instructional uses of environmental print in preschool and primary grades. In A. DeBruin-Parecki (Ed.), *Effective early literacy practice: Here's how, here's why*. (pp. 15-24). Baltimore, Maryland: Paul. H. Brookes.
- Evans, M. A., Shaw, D., & Bell, M. (2000). Home literacy activities and their influence on early literacy skills. *Canadian Journal of Experimental Psychology*, *54*, 65-75.
- Foulin, J. N. (2005). Why is letter-name knowledge such a good predictor of learning to read? *Reading and Writing*, *18*, 129-155.
- Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. Patterson, J. Marshall & M. Coltheart (Eds.), *Surface dyslexia: Neuropsychological and cognitive studies of phonological reading*. (pp. 301-330). London: Erlbaum.
- Gentry, J. R. (2005). Instructional techniques for emerging writers and special needs students at kindergarten and grade 1 levels. *Reading and Writing Quarterly*, *21*, 113-134.
- Goodall, M. (1984). Can four year olds "read" words in the environment? *Reading Teacher*, *37*, 478-482.
- Goodman, Y. (1986). Children coming to know literacy. In W. H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading (1-14)*. Norward, NJ: Ablex.



- Groff, P. J. (1984). Resolving the letter name controversy. *The Reading Teacher*, 37, 384-388.
- Hall, N. (1987). *The emergence of literacy*. London, UK: Hodder & Stoughton.
- Hamre, B. K., Justice, L. M., Pianta, R.C., Kilday, C., Sweeney, B., Downer., J. T., & Leach., A. (2010). Implementation fidelity of MyTeachingPartner literacy and language activities: Association with preschoolers' language and literacy growth. *Early Childhood Research Quarterly*, 25, 329-347.
- Haney, M. & Hill, J. (2004). Relationships between parent-teaching activities and emergent literacy in preschool children. *Early Child Development and Care*, 174, 215-228.
- Harste, J. C., Burke, C. L. & Woodward, V. A. (1981). Examining our assumptions: A transactional view of literacy and learning. *Research in the Teaching of English*. 18, 84-108.
- Hecht, S., & Close, L. (2002). Emergent literacy skills and training time uniquely predict variability in responses to phonemic awareness training in disadvantaged kindergarteners. *Journal of Experimental Child Psychology*, 82, 93-115.
- Henry, M. K., & Hook, P. (2006). Multisensory instruction: Then and now. *Perspectives: The International Dyslexia Association*, 32, 9-11.
- Hiebert, E. H. (1978). Preschool children's understanding of written language. *Child Development*, 49, 1231-1234.
- Hollingshead, A. B. (1975). *The four-factor index of social status*. New Haven, CT: Unpublished manuscript. Yale University.

- Hood, M., Conlon, E., & Andrews, G. (2008). Preschool home literacy practices and children's literacy development: A longitudinal analysis. *Journal of Educational Psychology, 100*, 252-271.
- Horner, S. L., (2005). Categories of environmental print: All logos are not created equal. *Early Childhood Education Journal, 33*, 113-119.
- Hulme, C. (1981). The effects of manual tracing on memory in normal and retarded readers: Some implications for multisensory teaching. *Psychological Research, 43*, 179-191.
- Jackson, N. E., & Coltheart, M. (2001). *Routes to Reading Success and Failure*. New York, NY: Psychology Press.
- Justice, L. M., & Ezell, H. K. (2001). Word and print awareness in 4-year-old children. *Child and Language Teaching and Therapy, 17*, 207-225.
- Justice, L. M., & Ezell, H. K. (2002). Use of storybook reading to increase print awareness in at-risk children. *American Journal of Speech-Language Pathology, 11*, 17-29.
- Justice, L. M., Pence, K., Bowles, R. B & Wiggins, A. (2006). An investigation of four hypotheses concerning the order by which 4-year-old children learn the alphabet letters. *Early Childhood Research Quarterly, 21*, 374-389.
- Kassow, D. Z. (2006). Environmental print awareness in young children. *Talaris Research Institute, 1*, 1-8.
- Kuby, P., & Aldridge, J. (2004). The impact of environmental print instruction on early reading ability. *Journal of Instructional Psychology, 9*, 106-114.

- Kuby, P., Aldridge, J., & Snyder, (1994). Developmental progression of environmental print recognition in kindergarten children. *Reading Psychology: An International Quarterly*, 15, 1-9.
- Lass, B. (1982). Portrait of my son as an early reader. *The Reading Teacher*, 36, 20-28.
- Levin, I., Shatil-Carmon, S., & Asif-Rave, O. (2006). Learning of letter names and sounds and their contribution to word recognition, *Journal of Experimental Child Psychology*, 93, 139-165.
- Lomax, R. G., & McGee, L. M. (1987). Young children's concepts about print and reading: Toward a model of word reading acquisition. *Reading Research Quarterly*, 22, 237-256.
- Lujan, M. E., & Wooden, S. L. (1984). An exploration of environmental correlates of early childhood literacy. (Report No. PS 015 101). New Mexico: New Mexico State University. ERIC Document Reproduction Service No. ED 258 696.  
Retrieved from  
([http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content\\_storage\\_01/0000019b/80/32/12/e1.pdf](http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/32/12/e1.pdf). Accessed: 13/7/09).
- Mason, J. M. (1980). When do children begin to read: an exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly*, 15, 203-227.
- Masonheimer, P. E., Drum, P. A., & Ehri, L. C. (1984). Does environmental print identification lead children into word reading? *Journal of Reading Behaviour*, 16, 257-271.

- McBride-Chang, C. (1999). The ABC's of the ABC's: The development of letter-name and letter-sound knowledge. *Merrill-Palmer Quarterly*, 45, 285-308.
- McCormick, C., & Mason, J. (1981). What happens to kindergarten children's knowledge about reading after a summer vacation? *The Reading Teacher*, 35, 164-172.
- McGee, L. M., Lomax, R.G., & Head, M. H. (1988). Young children's written language knowledge: What environmental print and functional print reading reveals. *Journal of Reading Behaviour*, 20, 99-118.
- McGee, L. M. & Richgels, D. J. (1989). "K is Kristen's": Learning the alphabet from a child's perspective. *The Reading Teacher*, 43, 216-225.
- Moats, L. C & Farrell, M. L. (2005). Multisensory structured language education. In J. R. Birsch (Ed.), *Multisensory teaching of basic language skills* (2<sup>nd</sup> ed., pp. 23-41). Baltimore, Maryland: Paul H. Brookes.
- Molfese, V. J., Beswick, J. L., Molnar, A., & Jacobi-Vessels, J. (2006). Alphabetic skills in preschool: a preliminary study of letter naming and letter writing. *Developmental Neuropsychology*, 29, 5-19.
- National Early Literacy Panel. (2008). *Developing early literacy: Report of the National Early Literacy Panel, a scientific synthesis of early literacy development and implications for intervention*. Washington, DC: National Institute for Literacy. (Retrieved from <http://www.nichd.nih.gov/publications/pubs/upload/NELPReport09.pdf> Accessed 19-8-2011).

- Neuman, S. B., & Roskos, K. (1993). Access to print for children of poverty: Differential effects of adult mediation and literacy-enriched play settings on environmental and functional print tasks. *American Educational Research Journal, 30*, 95-122.
- Neumann, M. M. (2007). *Up Downs: A fun and practical way to introduce reading and writing to children aged 2-5*. Sydney: Finch.
- Neumann, M. M., Hood, M., & Neumann, D. L. (2009). The scaffolding of emergent literacy skills in the home environment: A case study. *Early Childhood Education Journal, 36*, 313-319.
- Neumann, M. M., & Neumann, D. L. (2010). Parental strategies to scaffold emergent writing skills in the preschool child within the home environment. *Early Years: An International Journal of Research and Development, 30*, 79-94.
- Neumann, M. M., Hood, M., Ford, R. M., & Neumann, D. L. (in press). The role of environmental print in emergent literacy. *Journal of Early Childhood Literacy*.
- Neumann, M. M., Hyde, M. B., Neumann, D. L. Hood, M., & Ford, R. M. (in press). Multisensory Methods for Early Literacy Learning. In G. Andrews & D. L. Neumann (Eds), *Beyond the Lab: Applications of Cognitive Research in Memory and Learning*.
- Piasta, S. P., Pupura, D.J., & Wagner, R. K. (2010). Fostering alphabet knowledge development: a comparison of two instructional approaches. *Reading & Writing, 23*, 607-626.

- Prior, J. L. (2003). Real world print in the classroom: meaningful connections for learning to read. Unpublished Doctoral Dissertation. Arizona State University, Arizona USA. (Retrieved from Proquest UMI No. 3084666).
- Purcell-Gates, V. (1996). Stories, coupons, and the TV guide: Relationships between home literacy experiences and emergent literacy knowledge. *Reading Research Quarterly, 31*, 406-428.
- Reutzel, D. R., Fawson, P. C., Young, J. R., Morrison, T. G., & Wilcox, B. (2003). Reading environmental print: What is the role of concepts about print in discriminating young readers' responses? *Reading Psychology, 24*, 123-162.
- Ritchey, K. D. (2008). The building blocks of writing: Learning to write letters and spell words. *Reading and Writing, 21*, 27-47.
- Roberts, J., Jurgens, J., & Burchinal, M. (2005). The role of home literacy practices in preschool children's language and emergent literacy skills. *Journal of Speech, Language and Hearing Research, 48*, 345-359.
- Salewski, W. C. (1995). *The effect of environmental print reading on the literacy development of kindergarten children*. Unpublished Master's Dissertation, The University of British Columbia, Vancouver Canada. (Retrieved from [https://circle.ubc.ca/bitstream/2429/3660/1/ubc\\_1995-0145.pdf](https://circle.ubc.ca/bitstream/2429/3660/1/ubc_1995-0145.pdf). Accessed 27/7/2009).
- Saracho, O. N. (1997). Using the home environment to support emergent literacy. *Early Child Development and Care, 127-128*, 210-216.

- Sénéchal, M., Le Fevre, J., Thomas, E. M., & Daley, K. E. (1998). Differential effects of home literacy experiences on the development of oral and written language. *Reading Research Quarterly, 33*, 96-116.
- Sénéchal, M., & Le Fevre, J. (2002). Parental involvement in the development of children's reading skill: a five year longitudinal study. *Child Development, 73*, 445-460.
- Share, D. L. (2004). Knowing letter names and learning letter sounds: a causal connection. *Journal of Experimental Child Psychology, 88*, 213-233.
- Sinclair, A., & Golan, M. (2002). Emergent Literacy: A case-study of a two-year-old. *Early Child Development and Care, 172*, 555-572.
- Snow, C. E., Burns, S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Sonnenschein, S., & Munsterman, K. (2002). The influence of home-based reading interactions on 5-year-olds' reading motivations and early literacy development, *Early Childhood Research Quarterly, 17*, 318-337.
- Stanovich, K. E., & West, R. F. (1989). Exposure to print and orthographic processing. *Reading Research Quarterly, 24*, 402-433.
- Stuart, M., & Coltheart, M. (1998). Does reading develop in a sequence of stages? *Cognition, 30*, 139-181.
- Tabachnick, G. G., and Fidell, L. S. (2007). *Experimental Designs Using ANOVA*. Belmont, CA: Duxbury.

- Teale, W. H., & Sulzby, E. (1986). Emergent literacy as a perspective for examining how young children become readers and writers. In W. H. Teale & E. Sulzby, (Eds.), *Emergent Literacy: Reading and Writing* (pp. 7-25). Norwood, NJ: Ablex Publishing.
- Treiman, R., Levin, I., & Kessler, B. (2007). Learning of letter names follows similar Principles across languages: Evidence from Hebrew. *Journal of Experimental Child Psychology*, 96, 87–106.
- Treiman, R., Tincoff, R., Rodriguez, K., Mouzaki, A., & Francis, D. (1998). The foundations of literacy: Learning the sounds of the letters. *Child Development*, 69, 1524-1540.
- Vadasy, P. F., & Sanders, E. A., (2010). Efficacy of supplemental phonics-based instruction for low-skilled kindergarteners in the context of language minority status and classroom phonics instruction. *Journal of Educational Psychology*, 102, 786-803.
- Vera, D. (2007). *The use of popular culture environmental print to increase the emergent literacy skills of prekindergarten children in one high-poverty urban school district*. Unpublished doctoral dissertation, Texas A & M University, Texas. (Retrieved from <http://proquest.umi.com.libraryproxy.griffith.edu.au/pqdweb> Accessed 22/3/09).
- Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early Childhood Research Quarterly*, 9, 153-170.
- Vukelich, C., Christie, J., & Enz, B. (2008). *Helping young children learn language and literacy: Birth through kindergarten*. Boston, MA: Pearson.



- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.
- Webster-Stratton, C., Reid, M. J., & Stoolmiller, M. (2008). Preventing conduct problems and improving school readiness: evaluation of the Incredible Years Teacher and Child Training Programs in high-risk schools. *The Journal of Child Psychology and Psychiatry*, *49*, 471-488.
- Weigel, D. J., Martin, S. S., & Bennett, K. K. (2006). Contributions of the home literacy environment to preschool-aged children's emerging literacy and language skills. *Early Child Development and Care*, *176*, 357-378
- Wepner, S. B. (1985). Linking logos with print for beginning reading success. *Reading Teacher*, *38*, 633-639.
- Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, *69*, 848-872.
- Wood, D., Bruner, J. C., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, *17*, 89-100.
- Wood, C. (2002). Parent-child preschool activities can affect the development of literacy skills. *Journal of Research in Reading*, *25*, 241-258.
- Worden, P. E., & Boettcher, W. (1990). Young children's acquisition of alphabet knowledge. *Journal of Reading Behaviour*, *22*, 277-295.
- Zafrana, M., Nikoitsou, K., & Daniilidou, E. (2000). Effective learning of writing and reading at preschool age with a multisensory method: A pilot study. *Perceptual and Motor Skills*, *91*, 435-446.

## **Chapter 9**

### **General Discussion**

This PhD extended existing research (e.g., McGee & Richgels, 1989; Prior, 2003; Purcell-Gates, 1996; Vera, 2007) on the use of environmental print to scaffold emergent literacy in preschool aged children. First, longitudinal case studies (Studies 1 & 2) were conducted that described how one mother scaffolded children's emergent literacy in the home setting using available and personally meaningful environmental print. For example, print interactions occurred around children's favourite toy logos (e.g., My Little Pony) and food labels (e.g., MILO drink). Second, observations of a larger sample of mother-child dyads interacting with environmental print enabled a broader examination of maternal use of this resource during play and a joint writing activity (Studies 3 & 4). In these observational studies, the relationship between maternal environmental print referencing and the child's emergent literacy was also examined. Finally, the effects of directly using environmental print to scaffold emergent literacy and print motivation were investigated in a preschool setting (Study 5). This study employed a randomised controlled trial design to compare the use of environmental print to standard print and a no-intervention control on print motivation, environmental print and standard print word reading, letter name and sound knowledge, letter writing, and print concepts.

#### **Summary of Main Findings**

The longitudinal case studies 1 and 2 extended previous case studies that had focussed mainly on children's environmental print interactions (Lass, 1982; McGee & Richgels, 1989; Sinclair & Golan, 2002). They described in detail how one mother used

environmental print to scaffold her children's learning of letter names, sounds, and shapes by pointing out letters embedded in product labels, tracing them with a finger and writing the letters in the air. The use of environmental print was reported to increase the children's motivation to explore print further in their surroundings. The multisensory strategies (i.e., tactile and kinaesthetic) the mother used to help her children interact with environmental print were successful in engaging them in each print interaction. These studies also described how the children began to use these environmental print strategies to initiate their own exploration of environmental print for example by pointing out, identifying, and copying letters and words from product labels (e.g., TEXTA).

To check the generalisability of these case study findings, Study 3 used observational methods to document the ways in which a larger sample of mothers naturally use environmental print to scaffold emergent literacy during unprompted play. Only a small number of mothers' referenced letters embedded in environmental print words while playing with their child. However, over two-thirds of the mothers referenced environmental print words. When referring to environmental print, mothers used similar strategies to those observed in the case studies (1 & 2), such as pointing out environmental print words, labelling letters by their name or sound, and tracing environmental print with a finger. In addition, the maternal letter referencing interactions were more teaching-oriented (where mothers repeatedly pointed to a specific letter saying its name or sound) than general word referencing during the play. Fewer letter-referencing interactions may have occurred because mothers were focussed on engaging their child in play rather than in literacy activities. It is possible that if mothers were prompted to use the play session to teach their child about letters, a greater number may have encouraged their child to interact with letters in the

surrounding print. Nevertheless, the evidence that mothers did use environmental print to scaffold letter and word learning during play without prompting indicates that they naturally do this and raises the possibility that the quality of these environmental print interactions could be enhanced through parent coaching.

Maternal referencing of environmental print during play was found to be positively associated with children's print concepts. This suggests that environmental print referencing behaviours such as pointing to environmental print words and running a finger underneath the letters from left to right whilst reading the word may facilitate skills in directionality, the concept of a word, and big and little letters. Maternal referencing of environmental print was also positively related to letter and name writing. This suggests that guiding children to visually attend to letters in surrounding print may assist their memory of letter shapes for use during writing. It is also possible that mothers may have capitalised on their child's knowledge of print concepts and letters by drawing their attention to letters and words within environmental print. Being observational, it is impossible to determine the direction of these relationships between maternal referencing of environmental print and children's emergent literacy skills.

In contrast, letter name and sound knowledge was not related to maternal referencing of environmental print. Very few mothers referenced individual letters in environmental print so one explanation is that is required in order to foster the child's development of letter name and sound knowledge. If mothers were encouraged to focus on individual letters and refer to their names and sounds, this might foster this aspect of the child's letter knowledge. Similarly, phonological awareness was not related to environmental print referencing behaviours. No behaviours were observed in which mothers used environmental print to teach phonemic awareness like initial and final phonemes nor did they engage the child in rhyming games related to the environmental

print words. Therefore, this could explain the lack of such a relationship. However, it is also possible that this sort of spontaneous and unprompted maternal environmental print referencing is not particularly beneficial to development of letter name and sound knowledge or phonological awareness. Indeed even with a more directed teacher-led program, Prior (2003) did not find a specific effect of environmental print use on letter knowledge. It is possible that spontaneous maternal referencing of environmental print words may be most beneficial in developing print concepts as was found in previous studies (Vera, 2007; Wepner, 1985). In addition, as other studies had not investigated aspects of writing and environmental print the present findings represent a novel contribution.

Mothers who engaged in more environmental print referencing behaviours during the play session also reported reading more to their child at home. Thus, pointing out and using environmental print may be a common literacy activity used by those parents who already engage in other more formal literacy activities like storybook reading. The present findings are also consistent with previous observational studies that have shown that parents do interact with environmental print and point it out to their children (Teale, 1986) and that print referencing is related to emergent literacy (Purcell-Gates, 1996).

Following on from the grocery shop play, mothers were asked to help their child write a grocery list (Study 4). Observations were made of the extent to which they utilised surrounding food products, signs, and posters; although they were not prompted to use that print. In addition, observations were made of their general strategies for scaffolding the child's writing. Only a small number of mothers spontaneously used environmental print to scaffold their child's writing. However, these mothers used a range of strategies similar to those reported in the case studies (1 & 2) such as pointing

out and naming letters, encouraging copying of environmental print, and using descriptive and directional language to help children shape letters. This provided further evidence that some mothers use environmental print during joint writing to scaffold their child's letter and word writing. However, due to the small number who used environmental print, no conclusions could be drawn about its effectiveness in emergent writing.

Study 4 also extended the research by Aram and Levin (Aram, 2010; Aram & Levin, 2001; 2002) with Hebrew script to an English-speaking Australian sample. English alphabetic script differs to Hebrew script in a number of ways. For example, Hebrew is written from right to left and consists of 22 letters, 5 of which change when placed at the end of a word, and vowels are written underneath or above consonants (Nicholson, 2010). The general print mediation strategies used by mothers in the present study were similar to Aram (2010) who reported Hebrew mothers using descriptive language to scaffold their child's letter shaping. Therefore, despite the differences in these two scripts, these strategies that mothers use to scaffold children's early printing appear to be universal. In addition, the present joint writing study is novel in the sense that it is the first (apart from the case studies) to describe in detail mothers' natural use of environmental print to scaffold children's writing. However, as only four mothers utilised it, the benefits of environmental print to emergent writing requires further investigation.

Study 4 also showed that maternal print mediation (level of scaffolding of letter shaping) and maternal grapho-phonemic mediation (level of scaffolding of letter-sound connections) was positively related to children's letter sound knowledge. One explanation of this finding is that the maternal print mediation (e.g., using directional and descriptive language) and maternal help in connecting letter shapes to sounds

during word writing fosters children's letter sound knowledge. Alternatively, children's level of letter sound knowledge may have instead influenced the level of maternal mediation. This later suggestion raises that possibility that mothers may be sensitive to children's letter sound knowledge as they scaffold the child's writing attempts. When children show more developed letter sound knowledge, mothers may be more likely to use letter-sound correspondences to scaffold their word writing. When the child has less letter sound knowledge, mothers use lower order mediation strategies.

No relationship was found between maternal mediation and letter name knowledge in Study 4. However, Aram (2007) and Aram and Levin (2001; 2002) found maternal mediation to be positively associated with letter name knowledge and phonological awareness, respectively. The failure to find these associations in the Study 4 may have been due to the younger age of the participants. For example, Aram's (2007) sample had a mean age of 5 years and 7 months whereas the mean age of the present sample was 4 years and 3 months. The lower developmental level of literacy abilities in the present study may have contributed to these different results.

Studies 1 to 4 were used to inform the design of the final intervention Study 5. Studies 1 to 4 provided some evidence of the benefits of using environmental print to scaffold emergent literacy. The case studies 1 and 2 showed how environmental print could be used to scaffold letter name, sound, and shape knowledge and print motivation in preschool age children. However, as these were based on descriptive and qualitative data from only two children, it is difficult to generalise to the wider population. Study 3 showed that maternal environmental print referencing during play was related to print concepts and letter and name writing. Due to the correlational nature of the study, however, conclusions regarding the causal effects of environmental print on emergent literacy could not be made. To determine the direct effects of environmental print on

emergent literacy growth, a randomised controlled intervention (Study 5) was conducted.

Previous studies have investigated the direct use of environmental print by teachers/instructors to enhance emergent literacy (Prior, 2003; Salewski, 1995; Vera, 2007; Wepner, 1985) and found positive effects on print concepts, letter recognition, reading attitude, and environmental print reading. However, these studies used quasi-experimental designs and combined storybook activities with environmental print activities making it difficult to ascertain the effect of using environmental print activities alone on emergent literacy. Therefore, Study 5 extended this previous research by using a more rigorous experimental design. Children were randomly assigned to ensure equivalency of groups, a wider range of emergent literacy skills (letter name and sound knowledge, letter writing, print concepts, environmental print and standard print word reading and print motivation) was measured pre- and post- test, and a 2-month follow-up test was included to determine whether any gains from the intervention were sustained over the longer term. Moreover, Study 5 included a standard print group as a comparison group to determine whether the unique appearance of environmental print helps or hinders children's learning as this has not been previously examined. In addition, a no-intervention control group who received the normal preschool activities was included to control for natural developmental gains in, and the effects of typical classroom activities on these emergent literacy skills over this time.

Using environmental print was superior to the no intervention control group in enhancing letter sound knowledge, letter writing, standard print and environmental print word reading, and print motivation at post- and follow-up test. It was also superior to this control group in enhancing print concepts but only at post-test; this effect was not sustained at follow-up. Only focussing on letters in words may not be the best way to



sustain print concepts over a longer period than the intervention. Previous interventions that have fostered print concepts have included logo book making activities (e.g., Salewski, 1995; Wepner, 1985). That broader experience with book activities may be needed to sustain these skills over the longer term.

In contrast to this, the standard print group was only better than the control group on letter writing and standard print word reading at post-test, but these gains were not sustained 2 months later. Thus, more gains in emergent literacy skills were made with the use of environmental print than with standard print. Furthermore, the environmental print group was better than the standard print group on print motivation and environmental print reading at both post- and follow-up tests and on letter writing at follow-up test. This showed that using black standard print on white cards was not as effective in sustaining word reading or letter writing or promoting print motivation. The direct comparison of print in its contextual and standard print form allowed the teasing out of the effects of the unique appearance of environmental print. Clear evidence emerged that using environmental print with its colourful and meaningful logos did not distract children but rather helped them de-contextualise it and focus on letters and words, facilitating learning.

Unexpectedly, there were no significant differences between groups on letter name knowledge even though this was specifically taught during the program. It is possible that children across groups may have been gaining letter name knowledge through daily experiences with parents at home or carers at the childcare centres as also speculated in a recent letter training study by Piasta, Purpura, and Wagner (2010). Similarly, Prior (2003) did not find a difference between environmental print treatment and control groups on letter name or sound knowledge. This may have been due to a strong emphasis on letter learning in her control classrooms masking any effects of

environmental print. In contrast to Prior's results, the present intervention (Study 5) did find that using environmental print was better than no-intervention in enhancing letter sound knowledge.

Children's age and prior letter sound knowledge may also influence the effectiveness of using environmental print as an instructional tool. For example, children in the present intervention (Study 5) were preschool age with little letter sound knowledge at pre-test (this was deliberately restricted in the current sample to ensure the children were either in the logographic stage of reading development or just entering the partial alphabetic stage). Letter sounds were not formally taught in these childcare settings. In contrast, Prior's (2003) participants were in primary school (kindergarten year) where they were explicitly taught letters during their regular school program. They also had high pre-test letter knowledge which may have explained their lack of positive outcomes for letter knowledge. Similar to Study 5, Vera's (2007) preschool sample had low pre-test letter identification scores and did show an improvement in letter identification following direct instruction with popular environmental print. Although it was unclear whether letter identification measured letter names or letter sounds, Vera's study does provide supporting evidence that environmental print instruction may be more beneficial for enhancing letter knowledge in preschool aged children with little letter knowledge or exposure to formal reading instruction.

Study 5 investigated the effects of environmental print on letter writing, which has not been examined in previous studies. While both the environmental print group and standard print group made similar gains over the control immediately following the intervention only the environmental print group sustained its gains over the longer term. It is possible that children trained in the environmental print strategies such as tracing environmental print letters with a finger may have adopted these strategies in their

broader contexts to support their writing in meaningful ways, for example, writing a word for a pretend shopping list from a cereal box at home. In contrast, standard print in books and flashcards is less visually attractive and accessible for young children, reducing the chance of their use for letter learning and writing. These findings indicate that environmental print may be an effective tool to support early writing in preschool children.

As expected children instructed with environmental print with its colourful logos had higher print motivation than the standard print and control groups. The visually attractive attributes of environmental print were found to stimulate children's interest in print more than standard black print on white cards. The current findings extend previous research by Wepner (1985) who found that children's attitude to reading improved following direct instruction with environmental print. However, Wepner's reading attitude questionnaire was somewhat limited as it focussed mainly on the concept of reading (e.g., Is learning to read easy or hard, Why do you think people read?) rather than children's interest in print. In contrast, the present Study 5 contained a more comprehensive battery of questions directly related to print interest, including interest in environmental print (e.g., likes/dislikes to do writing or to read letters and words on boxes). Furthermore, as Wepner did not conduct statistical analyses it is unclear whether their differences found on reading attitude were greater than would be expected by chance alone. However, the present Study 5 has confirmed Wepner's findings and provided strong evidence that environmental print can improve print motivation in preschool children.

Furthermore, anecdotal evidence from Study 5 showed that children in the environmental print group initiated discussions about product labels they had encountered at home and were observed to point out letters and words on signs and

posters as they walked back to their classrooms following each intervention session. In contrast, children in the standard print group did not display these behaviours.

Therefore, the sustained gains in print motivation made by children trained to focus on letters and words embedded in this ubiquitous and salient print may have resulted in children's further exploration of it in their broader contexts. Support for this also arises from the case studies (1 & 2) that showed children initiating interactions with environmental print at home during daily activities following maternal scaffolding.

Environmental print reading ability was greater in children instructed with environmental print. This finding was not unexpected and is in accord with previous research (e.g., Prior, 2003; Salewski, 1995; Wepner, 1985). An increase in environmental print reading ability may be advantageous, as it has been shown that logographic reading contributes to emergent literacy (Lomax & McGee, 1987) and the speed that children subsequently learn words in standard print (Cronin, Farrell, & Delaney, 1999). Furthermore, the environmental print group sustained their gains in standard print word reading at the 2-month follow-up whereas the standard print group, which was explicitly trained with those standard print words, did not. Although speculative, the gains made in environmental print reading could have helped children transfer this knowledge to learning words in standard print as was found by Cronin et al. (1999).

Previous research has shown that direct instructional use of environmental print in children aged 3 to 5 years can enhance letter identification (Vera, 2007), environmental print reading (Prior, 2003; Salewski, 1995; Wepner, 1985), print concepts (Vera, 2007; Wepner, 1995), and print motivation (Wepner, 1985). Using a more rigorous randomised control design, the present Study 5 found that immediately following the environmental print intervention, environmental print reading, print

motivation, and print concepts were enhanced compared to the control group. This confirms that the results found in previous studies could not be explained by pre-existing group differences, but were a genuine outcome of the intervention. It extends on those previous findings by showing that environmental print also enhances letter writing and sound knowledge and standard print word reading, and that gains in these as well as in print motivation were sustained 2 months after the intervention had ceased.

Most significantly, Study 5 provides evidence of environmental print's advantage over standard print by showing that it fostered higher print motivation than standard print. The benefits of increasing children's interest in print-related activities in the early years cannot be underestimated as print motivation influences children's future reading behaviour (e.g., Baker & Scher, 2002). Furthermore, it is possible that children trained to use environmental print strategies may have continued to do so in their broader contexts, initiating their own learning about print as was described in case studies 1 and 2. This may also explain the sustained gains in letter writing, print motivation, and environmental print word reading made by children in the environmental print intervention compared to the other groups.

In summary, the direct use of environmental print in the preschool intervention (Study 5) by a trained instructor was found to improve print motivation, environmental print reading ability, letter writing, print concepts, and letter sound knowledge. This supports the home case study (1 & 2) findings where a mother used environmental print to directly scaffold her preschool children's literacy learning resulting in growth of letter sound knowledge, letter writing and print motivation. Furthermore, maternal environmental print referencing in a larger sample of mothers in Study 3 was also found to be positively related to print concepts and letter writing. Thus, the positive impact of environmental print on letter writing that was found across the case (Study 1 & 2),

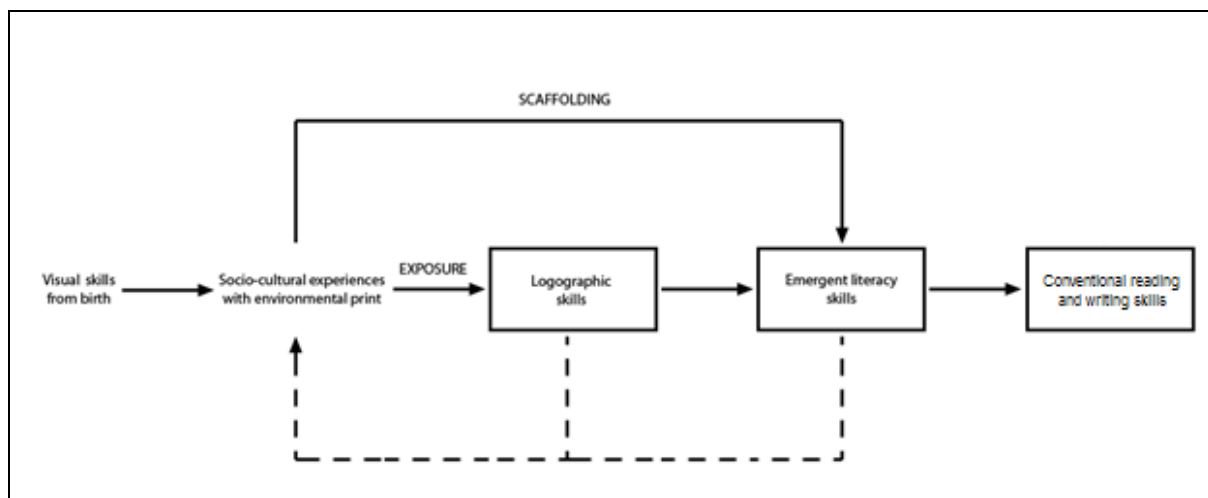
observational (Study 3), and intervention (Study 5) studies highlights the important role environmental print can play in writing development. However, the observational studies (3 & 4) showed that although the majority of mothers refer to environmental print words, they do not generally reference letters embedded in environmental print or refer to it during joint writing. Study 5 demonstrated that this guided attention to letters is important in developing emergent literacy skills. This suggests that mothers may require more strategic training in the use of environmental print in order to capitalise on this low-cost and salient literacy resource to foster emergent literacy and print motivation.

### **Environmental Print and Reading Development**

It is important to consider these research findings within the framework of existing theories of reading development. Current reading acquisition models (Ehri, 1995; Frith, 1985; Mason, 1980) propose that it begins with logographic/visual cue reading that does not use letter sounds to decode words (pre-alphabetic), followed by the use of some grapho-phonemic cues (partial-alphabetic), then mastery of the alphabet and full use of grapho-phonemic connections (full-alphabetic). This leads to fluent word reading (consolidated or conventional reading). Emergent literacy skills develop from birth prior to conventional word reading (Bowman & Treiman, 2004).

Figure 1 presents a model of where environmental print may be situated in early reading development. This EP model differs from traditional stage-like reading models as the process of literacy skill acquisition is viewed as cyclical in nature (represented by the dotted lines in Figure 1). Socio-cultural experiences with environmental print influence future print experiences and literacy growth, which, in turn, affect ongoing socio-cultural experiences with print in a cyclical fashion. The EP model is not intended

to replace existing reading models but to propose pathways that may aid in the exploration of the role of environmental print in emergent literacy development.



*Figure 1.* The role of environmental print in reading development (EP model)

The central pathway of the EP model (see Figure 1) follows the main phases of established reading models (e.g., Ehri, 1995). It begins by showing that young children are exposed to print early in life. Using their visual skills, they explore their surroundings. Through socio-cultural interactions with that surrounding print (such as those observed in the case studies 1 and 2 and observational studies 3 and 4), they develop logographic skills, whereby they rely on visual cues rather than letter-sound analysis to gain meaning from environmental print (e.g., Goodman, 1986; Harste, Burke, & Woodward, 1981; Lujan & Wooden, 1984). This is in accord with emergent literacy theory that posits that these critical visual and perceptual skills begin at birth and are shaped by socio-cultural experiences (Teale & Sulzby, 1986; Goodman, 1986; Hall, 1987). The ability of children to read environmental print logographically has been found to be positively associated with emergent literacy skills such as letter knowledge (Lomax & McGee, 1987). This link can be seen in the EP model (Figure 1).

Some researchers (e.g., Masonheimer, Drum, & Ehri, 1984; Ehri & Roberts, 2006) concluded that logographic reading is not a contributor to the reading system because children do not use letter-sound skills to decode the words and that, therefore, logographic reading is not associated with conventional word reading ability. Masonheimer et al. (1984)'s findings suggested non-readers are insensitive to letter details in environmental print. However, others argued that logographic reading is an important part of early reading development because it signifies that children are beginning to interpret and gain meaning from print (Bowman & Trieman, 2004; Whitehurst & Lonigan, 1998) and are sensitive to letters embedded in it (McGee, Lomax, & Head, 1988). For example, McGee et al. (1988) showed that 3- and 4- year-old non-readers who could read environmental print in context were aware that it consisted of letters by being able to identify them. Yannicopoulou (2006) found that Greek preschoolers could differentiate between Roman and Greek alphabet letters embedded in environmental print. Greek children are exposed to both Roman and Greek environmental print in their urban environment (e.g., logos, toy labels written in Roman e.g., McDonalds; and trading signs written in Greek e.g., ΕΠΑΥΛΙΣ) and are not formally taught letters in preschool. Thus, logographic readers are sensitive to letters embedded in environmental print in a range of languages.

It has also been suggested that when children are encouraged to attend to letters embedded in environmental print they may learn to de-contextualise it, aiding the development of emergent literacy skills (e.g., Adams, 1990; Clay, 1991; Enz, Prior, Gerard, & Han, 2008; McGee & Richgels, 1989; Prior, 2003; Vukelich, Christie, & Enz, 2008). It is from this perspective that a proposed environmental print scaffolding pathway was added to the EP model (see Figure 1). Evidence for the existence of this



scaffolding pathway and its benefits to emergent literacy was gained from the present research.

The strongest evidence for the benefits of using environmental print came from the intervention (Study 5). Using environmental print to scaffold emergent literacy produced positive outcomes in a range of emergent literacy skills as well as in print motivation and environmental print reading ability. These findings support the environmental print scaffolding pathway shown in Figure 1. Also supportive of this scaffolding pathway are the results of the observational Study 3 that showed that maternal environmental print referencing was correlated with children's print concepts and letter and name writing. It appears that more direct attention to letters embedded in environmental print as was done in the Study 5 intervention is required to produce a broader range of positive emergent literacy outcomes (i.e., letter sound knowledge, letter writing, environmental print reading, print concepts, and print motivation). In contrast, simply referencing whole environmental print words as was done by the majority of mothers in observational Study 3 does not appear to impact as strongly on emergent literacy (only print concepts and writing). The longitudinal case studies 1 and 2 also provided some evidence for this scaffolding, which was reported to foster the children's interest in print. This scaffolding helped those children to de-contextualise letters within the environmental print and, thus, equipped them to initiate their own exploration and learning of surrounding print.

The guided attention to environmental print in Study 5 may have also enabled those children to transfer these strategies to their broader environments in order to explore surrounding print further; for example, at home and during grocery shopping. This aspect is illustrated by the cyclical dotted pathway in the EP model (Figure 1) that reflects the ongoing process of socio-cultural experiences with environmental print

feeding into and further developing print knowledge. Therefore, in agreement with Cronin et al. (1999), the pre-alphabetic/logographic phase should be viewed as part of the early reading system because it signifies children's ability to interpret this print and reflects their increasing sensitivity to its elements.

However, the current research did not examine the paths beyond emergent literacy. Study 5 showed that children trained using environmental print had sustained gains in their standard print word reading ability compared to the standard print and control group. Possibly teaching words in environmental print may translate to recognition of its conventional form. These findings are in accord with Cronin et al.'s (1999) demonstration that preschool children learnt words presented in standard print more quickly if they could already read the words in environmental print form. The extent to which environmental print scaffolding can support children's movement from the pre-alphabetic phase into the partial alphabetic phase where children begin to use letter-sound analysis cues to read words requires further investigation. This could involve initially providing additional activities that encourage children to sound out the environmental print words whilst pointing to each letter.

In Study 3, one mother was observed doing this as she ran her finger under the word on the cereal box (Weetbix) and sounded it out to her child "Weetuhbuhiix". Then as she pointed to the letters, she asked her child about sounds in the word. Through this form of environmental print scaffolding, children may learn to use grapho-phonemic cues, facilitating their transition into the partial-alphabetic system to decode words. In Study 5, letters and sounds in environmental print were explicitly pointed out, and improvements were found in children's letter sound knowledge and standard print reading word. It is possible that using environmental print in this way helped facilitate children's movement towards the partial alphabetic phase. Extending this to using those

skills to sound out the whole words and to listen for specific sounds in environmental print words may produce even greater movement.

### **Environmental Print and Writing Development**

It was also important to consider the role of environmental print in emergent writing as only a few case studies to date had examined this (Baghban, 1984; Chan, Zi Juan, & Lai Foon, 2008). With their mother's encouragement, children in the case studies 1 and 2 (and particularly in Study 2) were described as attending to, writing, and copying environmental print words that were meaningful to them (e.g., labels on toys and food packaging) during daily activities. This showed that through socio-cultural experiences with environmental print, children were able to utilise it in their emergent writing and to learn about letters and words. In the joint-writing Study 4, only a small number of mothers used environmental print to scaffold their child's writing. Therefore, it was not possible to determine if maternal environmental print scaffolding was related to the child's writing ability.

However, Study 5 provided evidence of how environmental print specifically affected emergent writing. While both the standard print and environmental print group made similar letter writing gains and were performing better than control group at immediate post-test, only the environmental print group sustained these gains 2 months later. Therefore, using environmental print was more effective in improving letter writing over the longer term. It is possible that the children who were trained using environmental print continued to practise their letter writing using environmental print in their broader contexts as described in case study 2. The fact that letter sound knowledge was improved in the environmental print intervention group in Study 5 may have also assisted children's writing ability. This evidence highlights the potential

benefits of using environmental print as a scaffolding tool to enhance writing in preschool children. Study 5 did not examine word writing, but it is likely that environmental print can be used to assist in word writing as effectively as it was for letter writing. Developing letter writing initially using this resource would allow children to then utilise letters in surrounding print to write words, especially in conjunction with their letter sound knowledge.

Emergent writing can be included in the EP model (Figure 1) by considering children as initially writing letters and words logographically; by remembering their physical/visual features and by copying environmental print letter shapes and words without use of letter-sound analysis skills. Bloodgood (1999) described this in a name writing study. For example, 'Linnea' described her name as "It's a *L*, and a line with a dot, then two humps" (p. 361), and had learnt a rote pattern (logogram) to write her name. Through children's early visual attention to environmental print and logographic writing of this print, they begin to learn about letters and experiment with representing and writing them in their socio-cultural contexts. Furthermore, parental or adult scaffolding in which surrounding letters, words, and sounds are pointed out, and children are encouraged to do this and to copy them, may lead to growth in emergent writing skills (Figure 1).

However, additional strategies may be required to help move children from being logographic writers in the pre-alphabetic phase to partial alphabetic writers (where children begin to spell and write words semi-phonetically using initial and final letter sounds). This could be achieved by providing children with additional writing activities. For example, in writing a shopping list, they can be encouraged to refer to and sound out the labels on grocery labels before writing. These types of activities may

also encourage children to take the initiative in their own writing, thus facilitating their movement into the partial-alphabetic writing phase.

### **Practical Implications and Future Research**

This PhD research raises theoretical, methodological, and practical issues to be addressed in future studies. The EP model (Figure 1) describes how environmental print potentially fits into current theories of reading and writing development. Study 3 provided observational evidence of how parent use of environmental print was related to some aspects of emergent literacy. Study 5 provided further empirical evidence that the direct use of environmental print by an instructor in a preschool setting can enhance emergent literacy and print motivation. However, whether environmental print can be successfully used to facilitate children's movement from the pre-alphabetic into the partial alphabetic phase or further into conventional reading requires further research. Suggestions have been made in the previous section as to what extensions to the current program might facilitate that.

Several other adaptations to the intervention in Study 5 are suggested for future research. The current results were obtained from a researcher-led intervention. The effectiveness of the environmental print program when delivered by regular classroom teachers needs to be tested. Other studies in which environmental print interventions were delivered by regular classroom teachers found fewer positive outcomes (e.g., Prior, 2003). While other factors are likely to explain that, it remains to demonstrate if the present program is equally effective if delivered by classroom teachers.

Although the environmental print program in the present research was of relatively short duration (30 minutes per week for 8 weeks) moderate effect sizes were found, highlighting its potential practical benefits. Having regular classroom teachers

trained to use these strategies as opportunities arose throughout the day as well as in formal “lessons” might produce even stronger results as dosage is increased. Teachers could spontaneously point out letters on environmental print they encounter throughout the day in their classroom (Prior, 2003; Enz et al., 2008). For example, when a child is having lunch the teacher or assistant could point out the P on their POP TOPS drink label, ask the child what sound the P makes (Puh, Puh – /P/ /O/ /P/), and encourage them to trace the letters with their finger whilst saying the letter sounds. The environmental print program could be further adapted to meet the specific literacy needs and abilities of children. For example, younger children who require more assistance in physically writing letters could spend more time tracing letters embedded in the environmental print words.

Pedagogical factors are important to consider in using environmental print. Environmental print items should be selected to teach letters in order of their difficulty (Bowman & Treiman, 2004). The shapes of letters influence which are learnt first by children and the letters *O*, *B*, *A* are usually the easiest for children to recognise, in part, because of their familiar and basic shape (Justice, Pence, Bowles, & Wiggins, 2006). In contrast, *D*, *K*, *V* and *Y* are more difficult to learn and are among the last to be recognised (Bowman & Treiman, 2004). These letters were not included in the present intervention program for this reason. However, if the program was extended in duration, the more difficult letter shapes could be introduced following mastery of the easier letters. It may also be beneficial to encourage children to listen to the letter sounds/phonemes in the words in order to develop their phonological awareness. Study 5 did not explicitly do this. Pointing out graphophonemic connections whilst sounding out words may help facilitate children’s movement from the pre-alphabetic phase to the partial alphabetic phase of reading development.

Phonological awareness was measured in the observational studies 3 and 4. However, no relationship was found between environmental print referencing by parents and phonological awareness. This may be because letter sounds were rarely focused on by mothers. Further research is needed to examine the role of environmental print use in fostering development in phonological awareness. Phonological awareness is a strong predictor of future reading ability (e.g., Adams, 1990). If environmental print strategies can be developed to foster that, it is likely to also facilitate movement in the child's stage of reading development.

As suggested by previous researchers (e.g., Prior, 2003; Vera, 2007), it may be useful to link home and preschool practices by encouraging parents to point out environmental print to their child at home and bring environmental print items that are personally meaningful to them to preschool. Children could share them during environmental print activities and refer to letter sounds embedded in the print. As parents play a key role in children's early literacy development (e.g., Haney & Hill, 2004), making the connection between home and preschool literacy activities may increase children's attempts to explore environmental print further at home or when 'out and about'.

Indeed, Purcell-Gate's (1996) observational study of print use in the home showed that most print related activities occurred with environmental print (e.g., reading a flyer, reading print on cereal box labels or milk cartons) rather than storybook reading. Whether parents can effectively use environmental print to scaffold and enhance children's emergent literacy and print motivation in the home setting requires further research. Study 3 showed that maternal environmental print referencing was positively related to a couple of aspects of emergent literacy. However, only a few mothers referred to environmental print letters. Mothers may require specific training in

using environmental print strategies such as those used in Study 5 to help their child de-contextualise environmental print by focusing their attention on the letters and sounds within words. Future research needs to evaluate the outcomes for children's emergent literacy from a home-based environmental print program. Given the free nature of environmental print and the relatively low literacy abilities needed to read it, families from a range of SES and literacy backgrounds could engage with this tool to support their children's literacy. Furthermore, due to the ubiquitous nature of environmental print, it could be used anywhere and anytime; for example, in shops, driving in the car, and visiting places. In contrast to the more formal practice of storybook reading that does little to foster emergent literacy skills such as alphabet knowledge (e.g., Hood, Conlon, & Andrews, 2008), the large bold appearance of environmental print may provide increased opportunities for letter and word learning if supported through parent scaffolding.

Study 5 and previous intervention studies have only focussed on environmental print letters and words (e.g., Prior, 2003; Salewski, 1995; Vera, 2007; Wepner, 1985). However, environmental print also consists of numerals and mathematical symbols on signs (e.g., \$2.00), car number plates (e.g., EVN 269), and road signs (e.g., 50 km). Interestingly, in study 3, mothers and children frequently pointed out and labelled numbers on signs, money, credit cards, and the cash register during the grocery shop play session. One mother repeatedly traced the dollar sign (\$) with her finger to teach her child about the meaning of the price sign. The use of environmental print by a parent or adult to scaffold the development of emergent numeracy skills such as labelling numerals, tracing numeral shapes on product boxes, and discussing what these numbers and symbols mean would be worth investigating.



Finally, an important question to examine in future research is the role that multisensory activities (particularly tactile: tracing letters on environmental print and kinaesthetic: forming letter shapes in the air whilst saying their names and sounds) contribute to literacy learning. Mothers in the case studies 1 and 2 and observational studies 3 and 4 were observed using multisensory strategies during their environmental print interactions. These were incorporated into the intervention program in Study 5. The same multisensory activities were used for both the environmental print and standard print groups. Thus, differences in outcomes between the environmental print and standard print groups indicated that environmental print was an important factor for print motivation, environmental print reading, and letter writing. However, where the groups did not differ (i.e., letter sound knowledge, print concepts), it is not clear to what extent the multisensory activities contributed to growth in literacy skills.

Chapter 7 reviewed evidence that training children using tactile and kinaesthetic activities such as tracing the outline of letters with fingers enhances letter knowledge and letter writing in young children (Bara, Gentaz, Cole, & Sprenger-Charolles, 2004; Zafrana, Nikoitsou, & Daniilidou, 2000). In a recent fMRI study, James (2010) showed an increased blood oxygen-level-dependent activation in the visual cortex during letter perception in 4- to 5-year-old children who had been trained in letter writing compared to the control group with only visual training. James suggested that sensori-motor experiences that involve the stimulation of both motor and visual systems contribute to increased brain activation levels. The change in these neural circuits following the physical formation of letter shapes provides evidence that multisensory activities can strengthen brain connections important for letter learning. Thus, it is possible that stimulating kinaesthetic, tactile, auditory, and visual senses in the Study 5 intervention contributed to improvements in letter shaping abilities and letter sound knowledge.

## Conclusion

This PhD research has shown that mothers naturally use environmental print in ways that support children's emergent literacy. Furthermore, environmental print can enhance emergent literacy (letter writing, print concepts, letter sound knowledge, and environmental print and standard print word reading) when used directly in a preschool setting. The colourful and contextual nature of environmental print gives it certain advantages over using standard print for enhancing print motivation, which is an important factor in helping children engage in literacy activities and learning. It is likely that children continued to apply these environmental print strategies outside of the intervention in their broader surroundings to initiate their own literacy learning experiences, leading to sustained gains in this group.

These findings support the view that environmental print plays an important role in early reading and writing development. A key element of the pre-alphabetic phase is that young children are naturally interested in and visually attentive to this salient form of print. By capitalising on this behaviour and scaffolding their de-contextualisation of the print, children's movement along the pre-alphabetic phase and towards the partial alphabetic phase can be facilitated. However, the use of environmental print to scaffold children's movement beyond the partial alphabetic phase where graphophonemic skills are used to decode and spell words warrants further investigation. Tailoring the environmental print program for use by regular classroom teachers and parents in the home to scaffold children's emergent literacy and print motivation also requires further research. Encouraging more strategic use of environmental print in both of these settings will assist government efforts to increase the "quality [of] early learning and care experiences from birth [to] lay the foundation for a smooth transition to school" (Australian Government, 2005 p. 39).

## References

- Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge: MIT press.
- Aram, D. (2007). Sensitivity and consistency of maternal writing mediation to twin kindergartners. *Early Education and Development*, 18, 71-92.
- Aram, D. (2010). Writing with young children: a comparison of paternal and maternal guidance. *Journal of Research in Reading*, 33, 4-19.
- Aram, D., & Levin, I. (2001). Mother-child joint writing in low SES sociocultural factors, maternal mediation, and emergent literacy. *Cognitive Development*, 16, 831-852.
- Aram, D., & Levin, I. (2002). Mother-child joint writing and storybook reading: Relations with literacy among low SES kindergarteners. *Merrill-Palmer Quarterly*, 48, 202-224.
- Australian Government (2005). *National inquiry into the teaching of literacy: Teaching reading, report and recommendations* (Publication No. 0 642 77577 X). Canberra, Australian Capital Territory: Author.
- Baghban, M. (1984). *Our daughter learns to read and write: A case study from birth to three*. Newark Delaware: International Reading Association.
- Baker, L., & Scher, D. (2002). Beginning readers' motivation for reading in relation to parental beliefs and home reading experiences. *Reading Psychology*, 23, 239-269.

- Bara, F., Gentaz, E., Cole, P., & Sprenger-Charolles, L. (2004). The visuo-haptic and haptic exploration of letters increases the kindergarten-children's understanding of the alphabetic principle. *Cognitive Development, 19*, 433-449.
- Bloodgood, J. W. (1999). What's in a name? Children's name writing and literacy acquisition. *Reading Research Quarterly, 34*, 342-367.
- Bowman, M. & Treiman, R. (2004). Stepping stones to reading. *Theory into Practice, 43*, 295-303.
- Chan, L., Zi Juan, C., & Lai Foon, C. (2008). Chinese preschool children's literacy development: from emergent to conventional writing. *Early Years, 28*, 135-148.
- Clay, M. M. (1991). *Becoming literate: The construction of inner control*. Portsmouth, NH: Heinemann.
- Cronin, V., Farrell, D., & Delaney, M. (1999). Environmental print and word reading. *Journal of Research in Reading, 22*, 271-282.
- Ehri, L. C. (1995). Phases of development in learning to read words by sight. *Journal of Research in Reading, 18*, 116-125.
- Ehri, L. C. (2005). Learning to read words: theory, findings and issues. *Scientific Studies of Reading, 9*, 167-188.
- Ehri, L. C., & Roberts, T. (2006). The roots of learning to read and write: Acquisition of letters and phonemic awareness. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research: Vol. 2*. (pp. 113-130). New York: Guildford Press.

- Enz, B. J. Prior, J., Gerard, M. R., & Han, M. (2008). Exploring intentional instructional uses of environmental print in preschool and primary grades. In A. DeBruin-Parecki (Ed.), *Effective early literacy practice: Here's how, here's why*. (pp. 15-24). Baltimore, Maryland: Paul. H. Brookes.
- Frith, U. (1985). Beneath the surface of developmental dyslexia. In K. Patterson., J. Marshall & M. Coltheart (Eds.), *Surface dyslexia: Neuropsychological and cognitive studies of phonological reading*, (pp. 301-330). London, UK: Erlbaum.
- Goodman, Y. (1986). Children coming to know literacy. In W. H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (pp. 1-14). Norward, NJ: Ablex.
- Hall, N. (1987). *The emergence of literacy*. London: Hodder & Stoughton.
- Haney, M. & Hill, J. (2004). Relationships between parent-teaching activities and emergent literacy in preschool children. *Early Child Development and Care*, 174, 215-228.
- Harste, J. C., Burke, C. L. & Woodward, V. A. (1981). Children, their language and world: Initial encounters with print. (Final Report # NIE-G-79-0132). Bloomington, IN: Language Education Departments Indiana University (p 1-618).
- Hood, M., Conlon, E., & Andrews, G. (2008). Preschool home literacy practices and children's literacy development: A longitudinal analysis. *Journal of Educational Psychology*, 100, 252-271.
- James, K. H. (2010). Sensori-motor experience leads to changes in visual processing in the developing brain. *Developmental Science*, 13, 279-288.

- Justice, L. M., Pence, K., Bowles, R. B & Wiggins, A. (2006). An investigation of four hypotheses concerning the order by which 4-year-old children learn the alphabet letters. *Early Childhood Research Quarterly*, 21, 374-389.
- Lass, B. (1982). Portrait of my son as an early reader. *The Reading Teacher*, 36, 20-28.
- Lomax, R. G., & L. M. McGee. (1987). Young children's concepts about print and reading: Toward a model of word reading acquisition. *Reading Research Quarterly*, 22, 237-256.
- Lujan, M. E & Wooden, S. L. (1984). An exploration of environmental correlates of early childhood literacy. (Report No. PS 015 101). New Mexico: New Mexico State University. ERIC Document Reproduction Service No. ED 258 696.  
(Retrieved from [http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content\\_storage\\_01/0000019b/80/32/12/e1.pdf](http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/32/12/e1.pdf). Accessed: 13/7/09).
- Mason, J. M. (1980). When do children begin to read: an exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly*, 15, 203-227.
- Masonheimer, P. E., Drum, P. A., & Ehri, L. C. (1984). Does environmental print identification lead children into word reading? *Journal of Reading Behaviour*, 16, 257-271.
- McGee, L. M., Lomax, R.G., & Head, M. H. (1988). Young children's written language knowledge: What environmental print and functional print reading reveals. *Journal of Reading Behaviour*, 20, 99-118.

- McGee, L. M. & Richgels, D. J. (1989). "K is Kristen's": Learning the alphabet from a child's perspective. *The Reading Teacher*, 43, 216-225.
- Nicholson, S. (2010). *Complete Biblical Hebrew*. London, UK: Hachette.
- Piasta, S. P., Pupura, D.J., & Wagner, R. K. (2010). Fostering alphabet knowledge development: a comparison of two instructional approaches. *Reading & Writing*, 23, 607-626.
- Prior, J. L. (2003). *Real world print in the classroom: meaningful connections for learning to read*. Unpublished Doctoral Dissertation. Arizona State University, Arizona USA. (Retrieved from Proquest UMI No. 3084666).
- Purcell-Gates, V. (1996). Stories, coupons, and the TV guide: Relationships between home literacy experiences and emergent literacy knowledge. *Reading Research Quarterly*, 31, 406-428.
- Salewski, W. C. (1995). *The effect of environmental print reading on the literacy development of kindergarten children*. Unpublished Master's Dissertation, The University of British Columbia, Vancouver Canada. (Retrieved from [https://circle.ubc.ca/bitstream/2429/3660/1/ubc\\_1995-0145.pdf](https://circle.ubc.ca/bitstream/2429/3660/1/ubc_1995-0145.pdf). Accessed 27/7/2009).
- Sinclair, A., & Golan, M. (2002). Emergent literacy: a case-study of a two-year-old. *Early Child Development and Care*, 172, 555-572.
- Teale, W. H. (1986). Home background and young children's literacy development. In W.H. Teale & E. Sulzby (Eds.), *Emergent literacy: Writing and reading* (pp. 173-206). Norwood, NJ: Ablex.

Teale, W. H. & Sulzby, E. (Eds.) (1986). *Emergent literacy: Writing and reading*.

Norwood, NJ: Ablex.

Vera, D. (2007). *The use of popular culture environmental print to increase the emergent literacy skills of prekindergarten children in one high-poverty urban school district*. Unpublished doctoral dissertation, Texas A & M University, Texas. (Retrieved from

<http://proquest.umi.com.libraryproxy.griffith.edu.au/pqdweb> Accessed 22/3/09).

Vukelich, C., Christie, J., & Enz, B. (2008). *Helping young children learn language and literacy: Birth through kindergarten*. Boston, MA: Pearson.

Wepner, S. B. (1985). Linking logos with print for beginning reading success. *Reading Teacher*, 38, 633-639.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, 69, 848-872.

Yannicopoulou, A. (2006). The influence of environmental print on preschoolers' literacy development in a two-alphabet society. *L1 – Educational Studies in Language and Literature*, 6, 1-12.

Zafrana, M., Nikoitsou, K., & Daniilidou, E. (2000). Effective learning of writing and reading at preschool age with a multisensory method: A pilot study. *Perceptual and Motor Skills*, 91, 435-446.



## **Appendix A**

### **Ethics Clearance**

Ethics clearance was granted for this research and it was conducted in accordance with the approved protocol (Griffith University Reference ID: PSY/B3/09/HREC and PSY/63/10/HREC).

**Appendix B***Name Writing Scale*

---

Score	Name Writing Production
0	No production
1	Random scribbling
2	Controlled scribbling (e.g., dots, lines with no conventional letters present)
3	Random letter-like forms (pseudo-letters).
4	Strings of conventionally written letters (non-phonetic) in linear patterns or the first letter of their name
5	Name writing consisting of some correct letters
6	Name writing is generally correct and some letters may be written backwards.
7	Name writing and spelled correctly.

---

### Appendix C

*Children's Title Checklist: Percentage of Mothers Indicating Recognition for  
Children's Book Titles*

Real Titles	Percent Recognized	Foil Titles	Percent Recognized
The Cat in the Hat	100.00	Old Fox	20.00
The Very Hungry Caterpillar	100.00	Are You My Father?	14.29
Green Eggs and Ham	94.29	The Very Naughty Fairy	11.43
Where's Spot?	91.43	Hello Morning, Hello Day	8.57
Winnie the Pooh	85.71	How Andrew Saved the Day	2.86
Hairy Maclary from Donaldson's Dairy	77.14	Toby the Terrible Tip Truck	2.86
Possum Magic	77.14	Elephant Magic	0.00
We're Going on a Bear Hunt	65.71	Little Pat at the Beach	0.00
Are you my Mother?	57.14	Berty's White Christmas	0.00
Where is the Green Sheep?	48.57	Dairy Wood	0.00
Who Sank the Boat?	42.86		
Saggy Baggy Elephant	34.29		
Where the Wild Things Are	31.43		
The Gruffalo	31.43		
Harry the Dirty Dog	28.57		
The Jolly Postman	22.86		
Blossum Possum	20.00		
Corduroy	11.43		
Max	5.71		
Duck in the Truck	2.86		

## Appendix D

### Home Literacy Questionnaire

**SECTION A.** These questions ask some general details about your child and family. Some questions ask for information about the child's parents. Where possible, please answer for both parents (may be a step-parent, etc. who functions as a parent in the child's home). Remember all answers are confidential and anonymous- no names are attached.

1. What is your marital status?

Married or De Facto

Divorced or separated

Single and never married

2. Child's date of birth: \_\_\_\_\_

3. Mother's age: \_\_\_\_\_ Father's age: \_\_\_\_\_

4. Child's gender:

Male

Female

5. Were there any problems during the pregnancy or birth of this child?

No

Yes. Please give details:

---



---



---

6. What is the main language spoken in your home?

English

Other. What language?

---

7. What is the cultural group (e.g., Australian, New Zealander, Japanese) of the child's:

Mother: \_\_\_\_\_

Father: \_\_\_\_\_

8. Tick all of the following that either your child has experienced or that you have concerns about. Please give details about all that you have ticked including whether your child has seen a doctor or other specialist and any intervention or treatment that your child has received

- Speech or language problems
- Regular ear infections and/or grommets
- Other problems with hearing
- Problems with eyesight
- Any serious illness or injury

---



---

Give specific details about the highest level of education (e.g., Grade 10 high school certificate; Child Care certificate at TAFE; Apprenticeship; Bachelor's degree; Post-graduate training)

completed by the child's:

Mother: \_\_\_\_\_

Father: \_\_\_\_\_

9. What is the occupation of the child's:

Mother: \_\_\_\_\_

Father: \_\_\_\_\_

10. In a typical week, how many hours does each parent work or study outside of the home?

Mother: \_\_\_\_\_ hours      Father: \_\_\_\_\_ hours

---

**THIS IS THE END OF SECTION A. PLEASE GO ON TO SECTION B WHEN YOU ARE READY.**

**SECTION B. These questions ask about home activities that you or the family do with your child**

1. In a typical week, how many hours is your child read a story book by a family member.

\_\_\_\_\_ hours

2. Please estimate the number of books this child owns \_\_\_\_\_

3. How frequently does your child:

	Never	Occasionally*	Fortnightly	Weekly	Daily	Several Times Daily
• Have a story book read to them	1	2	3	4	5	6
• Have an alphabet book read to them	1	2	3	4	5	6

\***Occasionally** = less often than once a fortnight

4. How often does your child do the following while being read a book?

	Never	Rarely	Occasionally*	Once per story	Several times/story
• Say the next word/s in a familiar story	1	2	3	4	5
• Point out letters in words	1	2	3	4	5
• Point out words in the story	1	2	3	4	5

\* **Rarely** = only a couple of times you can remember; **Occasionally** = every couple of times read to

5. Tick all of the following items that your child has at home.

<input type="checkbox"/>	Alphabet chart/poster or frieze on the wall
<input type="checkbox"/>	Flash cards to teach letters
<input type="checkbox"/>	Computer programs to teach alphabet, phonics or reading
<input type="checkbox"/>	Books to teach writing, e.g., letters to trace over and copy
<input type="checkbox"/>	“Electronic” books (e.g., child hears letter/word if they touch with pointer)
<input type="checkbox"/>	Magnetic, plastic, or foam letters
<input type="checkbox"/>	Alphabet jigsaw puzzles
<input type="checkbox"/>	Alphabet CDs, DVDs or videos

6. Tick all of the writing activities your child does at home even if it is pretend writing.

<input type="checkbox"/>	Greeting cards
<input type="checkbox"/>	Shopping lists
<input type="checkbox"/>	Story writing
<input type="checkbox"/>	Labels their drawings
<input type="checkbox"/>	Name writing
<input type="checkbox"/>	Copies letters and words from books
<input type="checkbox"/>	Greeting cards

## 7. How frequently does your child do the following at home?

	Never	Occasionally*	Fortnightly	Weekly	Daily	Several Times Daily
• Do some writing	1	2	3	4	5	6
• Recite the alphabet	1	2	3	4	5	6
• Write alphabet letters	1	2	3	4	5	6
• Write their name	1	2	3	4	5	6
• Ask how to write a word	1	2	3	4	5	6
• Says letter sounds	1	2	3	4	5	6
• Identifies and names letters	1	2	3	4	5	6
• Reads words	1	2	3	4	5	6
• Asks how to spell a word	1	2	3	4	5	6
• Ask what words on signs and labels say	1	2	3	4	5	6
• Reads words on signs or labels independently	1	2	3	4	5	6

\* **Occasionally** = less often than once a fortnight

8. In a typical week, how often do you or a family member point out **environmental print**; for example, road signs (e.g., “STOP”, car number plates), toy labels, print on clothing, food product labels or restaurant names to your child.

	Never	Occasionally*	Fortnightly	Weekly	Daily	Several Times Daily
• point out environmental print words	1	2	3	4	5	6
• point out environmental print letters	1	2	3	4	5	6
• point out environmental print numbers	1	2	3	4	5	6

\* **occasionally** = less than once per fortnight

Which signs or labels does your child know how to read (leave blank if none)?

---



---

## 9. At home does your child show an interest in

	Not interested at all	Slightly Interested	Quite Interested	Very interested
Story book reading	1	2	3	4
Environmental print words	1	2	3	4
Environmental print letters	1	2	3	4
Writing letters	1	2	3	4
Writing words	1	2	3	4

10. In a typical week, how often do you or another family member teach your child the following activities? “Teaching” refers to informal activities as well as deliberate teaching, e.g., you might point out that *Milk* starts with *M* and *M* says *mmm* while pouring milk on their cereal- that would be teaching about letter sounds.

	Never	Occasionally*	Fortnightly	Weekly	Daily	Several Times Daily
• the names of letters	1	2	3	4	5	6
• the sounds of letters	1	2	3	4	5	6
• to read words in books	1	2	3	4	5	6
• what signs or labels say	1	2	3	4	5	6
• words in surrounding environmental print	1	2	3	4	5	6
• letters in surrounding environmental print	1	2	3	4	5	6
• to write/copy letters	1	2	3	4	5	6
• to write/copy their name	1	2	3	4	5	6
• to write/copy words	1	2	3	4	5	6

\* **occasionally** = less than once per fortnight.



11. Below is a list of children's book titles. Some are real book titles and some are made-up. Please tick all of the ones that you recognise as real children's book titles. Don't guess. Only tick them if you know they are real books.

	The Gruffalo
	Duck in the Truck
	Are You My Father?
	Winnie the Pooh
	Possum Magic
	Little Pat at the Beach
	Old Fox
	Blossom Possum
	Hello Morning, Hello Day
	The Very Hungry Caterpillar
	Are you my Mother?
	The Jolly Postman
	The Cat in the Hat
	Green Eggs and Ham
	Dairy Wood

	Where is the Green Sheep?
	Where's Spot?
	Max
	The Very Naughty Fairy
	Hairy Maclary From Donaldson's Dairy
	Elephant Magic
	Where the Wild Things Are
	Berty's White Christmas
	Who Sank the Boat?
	Harry the Dirty Dog
	We're Going on a Bear Hunt
	Saggy Baggy Elephant
	Corduroy
	How Andrew Saved the Day
	Toby the Terrible Tip Truck

## Appendix E

### Intervention Program

For the **environmental print group**, words were presented on grocery products (e.g., “CORN FLAKES” on the cereal box). For the **standard print group** the same words were printed in manuscript form on cards. Both groups used the same weekly program, words and letters as described below.

#### **Week 1 Session (Focus letters M, I, O using MILO)**

**Activity 1:** Introduction to the words : “Today we are going to have some fun learning about letters using these words (MILO, FROOT LOOPS, CORNFLAKES, RICE BUBBLES, NUTRIGRAIN)”. Each word will be introduced to the children.

**Activity 2:** Singing with actions to learn directional terms up, down, around and across.

A) “Hands go up, hands go down, shake your hands and turn around”. (Move hands then foot then leg up and down).

B) “Round and round and round and round and round go the wheels of the car”. Ask what else goes round and round? (Move hands around in a circle shape).

C) Pretend your finger is a rocket ship and zoom your hand across the sky. (Move hand across the sky in a horizontal line).

D) Play the rocketship game where instructor says the words up, down, around, and across as children zoom there finger according to the direction given.

**Activity 3:** Focus letters (**M, I, O**). Word: MILO. [**point, say, move, trace method**]

Letter M: Present the MILO word to each child. Point to the word whilst underlining it with your finger and say MILO. Ask children to repeat the word. “Can you say this word MILO?”

The instructor models the following steps to the children (Point and Say and Move and Trace):

a) Visual: Point to the letter M and say the letter name “Its name is M”

b) Auditory: M makes a /m/ sound.

c) Kinaesthetic: Move your arm in the air the shape of the letter saying M for MILO goes up, down, up, down (write it in the sky).

d) Tactile: Trace the shape of the letter M with your finger saying up, down, up, down.

Now repeat steps (a) to (d) 3 times for each child. Activity 3 is repeated for the next focus letters (I, O). (Use short letter sounds for vowels).

**Activity 4:** Point out the letters M, I and O on COCO POPS, RICE BUBBLES, CORNFLAKES, PEPSI, MILO, VEGEMITE, SUNBEAM, MILK, SMITHS, LEGO, STOP, EXIT, FROOT LOOPS, NUTRIGRAIN) using the **point, say, move, trace method**.

**Activity 5:** Writing activity: Refer to the MILO word. Model writing each letter (M, I, O) separately on a magnetic sketch board using directional language (e.g., M for MILO goes up, down, up, down; I goes down, O goes around) say letter name and sound for each letter, make the letter shapes in the air. The children will practice writing these letter shapes themselves in

their own blank paged writing books with the instructor scaffolding their shaping using directional language.

### **Week 2 (Focus letters F, T, P using FROOT LOOPS)**

**Activity 1:** Revision: Present the word MILO to each child. Revise the letters M, I and O by pointing to the letter, saying its name, making its sound, moving their arm in the air in the shape of the letter and tracing the letter shape on the word.

**Activity 2:** Singing with directional language and actions to revise directional terms up, down, around and across (Hands go up, Round & Round, Zoom Across, Rocketship game).

**Activity 3:** Focus letters (F, T, P). Word: FROOT LOOPS [**point, say, move, trace method**]

Letter F: Present the FROOT LOOPS word to each child. Point to the word whilst underlining it with your finger and say FROOT LOOPS. Ask the child to repeat the word. “Can you say this word FROOT LOOPS?”

The instructor models the following steps to the child (Point and Say and Move and Trace):

- a) Visual: Point to the letter F and say the letter name “that’s the letter F for FROOT LOOPS”
- b) Auditory: F makes a “ffffff” sound.
- c) Kinaesthetic: Move your arm in the air the shape of the letter saying F for FROOT LOOPS goes down, across and across. (Write in the sky)
- d) Tactile: Trace the shape of the letter F with your finger saying down, across, and across.

Steps (a) to (d) are repeated 3 times for each child.

Letter T: Point to the letter T in FROOT LOOPS and follow the same steps as above but say T makes a “tuh” sound, it goes down and across.

Letter P: Point to the letter P in FROOT LOOPS and follow the same steps as above but say P makes a “puh” sound it goes down and around.

**Activity 4:** Point out the letters F, T, P on NUTRI-GRAIN, COCO POPS, KRAFT, POP TOPS, STOP, JUST JUICE, EXIT, KRAFT, UNCLE TOBYS, VEGEMITE, SMITHS, CORNFLAKES) using the **point, say, move, trace method**.

**Activity 5:** Writing activity: Refer to FROOT LOOPS word. Model writing each letter F, T, P separately on a magnetic sketch board using directional language (e.g., F goes down across and across, T goes down and across, P goes down and around, say letter name and sound and make the letter shapes in the air. The children will practice writing the letter shapes themselves with the instructor scaffolding their shaping using directional language. Then write/model all 3 letters on magnetic white board for children to write in their books.

### **Week 3 (Focus letters C, L, S using a CORNFLAKES)**

**Activity 1:** Revision: Present the words MILO and FROOT LOOPS. Revise the letters M, I, O, F, T, P from the previous week by pointing to the letter, saying its name, making its sound, moving their arm in the air in the shape of the letter and tracing the letter shape on the word.

**Activity 2:** Singing with directional language and actions to revise directional terms up, down, around and across. (Hands go up, Round & Round, Zoom Across, Rocketship game).

**Activity 3:** Focus letters (C, L, S). Environmental print word: CORNFLAKES. [**point, say, move, trace method**]

Letter C: Present the word CORNFLAKES to each child. Point to the word whilst underlining it with your finger and say CORNFLAKES. Ask the child to repeat the word. “Can you say this word CORNFLAKES?”

The instructor models the following steps to the child (Point and Say and Move and Trace):

- a) Visual: Point to the letter C and say the letter name “that’s the letter C for CORNFLAKES”.
- b) Auditory: C makes a “kuh” sound.
- c) Kinaesthetic: Move your arm in the air the shape of the letter saying C for CORNFLAKES goes around then stops!
- d) Tactile: Trace the shape of the letter C with your finger saying around and stop!

Steps (a) to (d) are repeated 3 times for each child.

Letter L: Point to the letter L in CORNFLAKES and follow the same steps as above but say L makes a “LLL” sound and goes down and across.

Letter S: Point to the S in CORNFLAKES and follow the same steps as above but say S makes a “SSS” sound and looks like a snake, slide your finger down the snake’s back.

**Activity 4:** Point out the letters C, L and S on COCO POPS, RICE BUBBLES and FROOT LOOPS, UNCLE TOBYS, PEPSI, STOP, SUBWAY, LEGO, PICNIC, SNICKERS, SOLO) using the **point, say, move, trace method**.

**Activity 5:** Writing activity: Refer to CORN FLAKES word. Model writing each letters (C, L, S) separately on a magnetic writing board using directional language (e.g., C goes around and then stops, L goes down and across, S for snake – slide your finger down the snake’s back) then make the letter shapes in the air. Say each letter name and sound for each letter. The children will practice writing the letter shapes themselves with the instructor scaffolding their shaping using directional language. Then write/model all 3 letters on magnetic white board for children to write in their books.

#### **Week 4 (Focus letters R, E, B using a RICE BUBBLES)**

**Activity 1:** Revision: Present words MILO, FROOTLOOPS, CORNFLAKES. Revise the letters M, I, O, F, T, P, C, L S by pointing to the letter, saying its name, making its sound, moving their arm in the air in the shape of the letter and tracing the letter shape on the word.

**Activity 2:** Singing with directional language and actions to revise directional terms up, down, around and across. (Hands go up, Round & Round, Zoom Across, Rocketship game).

**Activity 3:** Focus letters (R, E, B). Word: RICE BUBBLES. [**point, say, move, trace method**]

Letter R: Present the word RICE BUBBLES to each child. Point to the word whilst underlining it with your finger and say RICE BUBBLES. Ask each child to repeat the word. “Can you say this word RICE BUBBLES?”

The instructor models the following steps to the child (Point and Say and Move and Trace):

- a) Visual: Point to the letter R and say the letter name “that’s the letter R for RICE BUBBLES”.
- b) Auditory: R makes an “rrrrr” sound.
- c) Kinaesthetic: Move your arm in the air in the shape of the letter saying R for RICE BUBBLES goes down, around, and down.

d) Tactile: Trace the shape of the letter R with your finger saying down, around, and down.

Steps (a) to (d) are repeated 3 times for each child.

Letter E: Point to the letter E in RICE BUBBLES and follow the same steps as above but say E makes a /e/ sound (short e sound), it goes down, across, across, across.

Letter B: Point to the letter B in RICE BUBBLES and follow the same steps as above but say B is for Bubbles, it makes a “buh” sound and goes down, around, and around.

**Activity 4:** Point out the letters R, E and B on NUTRI-GRAIN, BERRI, VEGEMITE, SAMBOY, EXIT, HEINZ, UNCLE TOBYS, LEGO, SUBWAY, PEPSI using the **point, say, move, trace method**).

**Activity 5:** Writing activity: Refer to RICE BUBBLES word. Model writing each letter (R,E,B) separately on a magnetic writing board using directional language. (e.g., R for RICE BUBBLES goes down, around, and down, E goes down, across, across, and across, B for Bubbles goes down, around and around), then make the letter shapes in the air. Say each letter name and sound for each letter. The children will practice writing the letter shapes themselves with the instructor scaffolding their shaping using directional language. Then write/model all 3 letters on magnetic white board for children to write in their books.

#### **Week 5 (Focus letters N, G, A using a NUTRI-GRAIN)**

**Activity1:** Revision: Present the words MILO, FROOTLOOPS, CORNFLAKES, RICE BUBBLES. Revise the letters M, I, O, F, T, P, C, L, S, R, E, B by pointing to the letter, saying its name, making its sound, moving their arm in the air in the shape of the letter and tracing the letter shape on the word.

**Activity 2:** Singing with directional language and actions to revise directional terms up, down, around and across (Hands go up, Round & Round, Zoom Across, Rocketship game).

**Activity 3:** Focus letters (N, G, A). Word: NUTRI-GRAIN [**point, say, move, trace method**]

Letter N: Present the NUTRI-GRAIN word to each child. Point to the word whilst underlining it with your finger and say NUTRI-GRAIN. Ask each child to repeat the word. “Can you say this word NUTRI-GRAIN?”

The instructor models the following steps to the child (Point and Say and Move and Trace):

a) Visual: Point to the letter N and say the letter name “that’s the letter N for NUTRI-GRAIN”.

b) Auditory: N makes a “nnnn” sound.

c) Kinaesthetic: Move your arm in the air the shape of the letter saying N for NUTRI-GRAIN goes up, down, up.

d) Tactile: Trace the shape of the letter N with your finger saying up, down, up.

Steps (a) to (d) are repeated 3 times for each child.

Letter G: Point to the letter G in NUTRI-GRAIN and follow the same steps as above but say G for Grain makes a “guh” sound, it goes around and across.

Letter A: Point to the letter A in NUTRI-GRAIN and follow the same steps as above but say A makes an /a/ sound (short a sound) and goes up, down, and across.

**Activity 4:** Point out the letters N, G and A on CORNFLAKES, HEINZ, LEGO, SNICKERS, UNCLE TOBYS, SUBWAY, SUNBEAM, ARNOTTS, PICNIC, SAMBOY using the **point, say, move, trace method**.

**Activity 5:** Writing activity: Refer to NUTRI-GRAIN word. Model writing each letter (N,G,A) separately on a magnetic writing board using directional language (e.g., N goes up, down, up; G for Grain goes around and across; A for apple goes up, down, and across), then make the letter shapes in the air. Say each letter name and sound for each letter. The children will practice writing the letter shapes themselves with the instructor scaffolding their shaping using directional language. Then write/model all 3 letters on magnetic white board for children to write in their books.

#### **Week 6 Revision Session with focus on M, I, O, F, T**

**Activity 1:** Singing with directional language and actions to revise directional terms up, down, around, and across (Hands go up, Round & Round, Zoom Across, Rocketship game).

**Activity 2:** Present the words (MILO, FROOT LOOPS, CORNFLAKES, RICE BUBBLES, NUTRI-GRAIN, EXIT, LEGO, SUBWAY, STOP, PEPSI). Revise M, I, O, F, T, P, C, L, S, R, E, B, N, G, A by using the point, say, move, trace method.

**Activity 3:** Writing activity: Revise writing letters M, I, O, F, T Refer to MILO and FROOT LOOPS. Model writing each letter separately on a magnetic writing board using directional language then make the letter shapes in the air. Say each letter name and sound for each letter. The children will then practice writing these letter shapes themselves with the instructor scaffolding their shaping using directional language. Then write/model all 5 letters on magnetic white board for children to write in their books.

#### **Week 7 Revision will focus on P, C, L, S, R**

**Activity 1:** Singing with directional language and actions to revise directional terms up, down, around, and across. (Hands go up, Round & Round, Zoom Across, Rocketship game).

**Activity2:** Present the words (MILO, FROOT LOOPS, CORNFLAKES, RICE BUBBLES, NUTRI-GRAIN, EXIT, LEGO, SUBWAY, STOP, PEPSI). Revise M, I, O, F, T, P, C, L, S, R, E, B, N, G, A by using the point, say, move, trace method.

**Activity 3:** Writing activity: Revise writing letters P, C, L, S, R. Refer to FROOT LOOPS, CORNFLAKES & RICE BUBBLES. Model writing each letter separately on a magnetic writing board using directional language then make the letter shapes in the air. Say each letter name and sound for each letter. The children will practice writing the letter shapes themselves with the instructor scaffolding their shaping using directional language. Then write/model all 5 letters on magnetic white board for children to write in their books.

#### **Week 8 Revision will focus on E, B, N, G, A**

**Activity 1:** Singing with directional language and actions to revise directional terms up, down, around, and across. (Hands go up, Round & Round, Zoom Across, Rocketship game).

**Activity 2:** Present the words (MILO, FROOT LOOPS, CORNFLAKES, RICE BUBBLES, NUTRI-GRAIN, EXIT, LEGO, SUBWAY, STOP, PEPSI). Revise M, I, O, F, T, P, C, L, S, R, E, B, N, G, A by using the point, say, move, trace method.

**Activity 3:** Writing activity: Revise writing letters E, B, N, G, A. Refer to RICE BUBBLES, NUTRI-GRAIN. Model writing each letter separately on a magnetic writing board using directional language then make the letter shapes in the air. Say each letter name and sound for each letter. The children will practice writing the letter shapes themselves with the instructor

scaffolding their shaping using directional language. Then write letters on magnetic white board for children to write in their books.

**List of program materials required:** Cereal Boxes (300-500g) and grocery products:

- MILO, FROOT LOOPS, CORN FLAKES, RICE BUBBLES, NUTRI-GRAIN, EXIT, LEGO, SUBWAY, STOP, PICNIC, MILK, PEPSI, COCO POPS, SMITHS, SNICKERS, VEGEMITE, HEINZ, POP TOPS, SUNBEAM, ARNOTT'S, UNCLE TOBYS, JUST JUICE, BERRI, SAMBOY, SOLO, KRAFT.
- Magnetic Sketch Board, 48 page writing pad (blank sheets) per child, HB Lead Pencils.

## Appendix F

### Fidelity Coding Criteria

Fidelity Coding Criteria	Never	Some times	Mostly	Always
<b>Quality of Instruction</b>				
1. Instructor uses clear and concise age appropriate language	1	2	3	4
2. Instructor provides clear expectations of children	1	2	3	4
3. Instructor provides clear instructions	1	2	3	4
4. Instructor ensures children understand instructions	1	2	3	4
5. Instructor clearly demonstrates and provides guidance for activities	1	2	3	4
6. Instructor maintains children's attention, engagement and interest	1	2	3	4
7. Instructor provides praise and encouragement	1	2	3	4
8. Instructor interacts positively with children	1	2	3	4
9. Instructor displays a positive and enthusiastic approach	1	2	3	4
10. Instructor displays a warm and approachable manner	1	2	3	4
<b>Instructor's Adherence to Program</b>				
1. Instructor's language is in general accordance with the program script	1	2	3	4
2. All materials and resources are available and easily accessible	1	2	3	4
3. All materials and resources used are in accordance with the program activities	1	2	3	4
4. All components of the program session are completed	1	2	3	4