CHAPTER 5. DATA ANALYSIS: GROUP RESULTS

Introduction

The previous chapters explained the development and design of this study. This included the design and development of tasks based on the literature reviewed in Chapter 3. The next two chapters organise and examine the data collected using a number of different perspectives. Firstly, in Chapter 5, the children's literacy development as a group over an eighteen month period in 1990/1 is examined statistically. Tasks are analysed and trends in literacy development are identified and discussed for both the pre-school/Kindergarten (1990/1) data gathering period and the last data gathering period in 1995. Secondly, in Chapter 6, a number of minor tasks are analysed statistically and their contribution to the literacy profile of the group is assessed. Thirdly, profiles of the emergent literacy development of a number of individual children over time are developed and discussed in order to provide "windows" on the data.

The study collected data concerning the literacy development of a total of 28 children in varying degrees of detail. For some children who moved away or who were temporarily absent from the town for some months, incomplete sets of data exist. The data for these children have been incorporated where possible into group analyses. Complete information about 22 children was collected for the 1990/1 data gathering. For the 1990/1 and 1995 data gathering sessions, complete information for 18 children was collected.

Data Analysis Design

From an analysis of each task, a description of the literacy development of the group was arrived at for 1990/1. Literacy performance in 1995 also feeds into this picture of literacy development for the group and for selected individuals. The design also details the methods used to present latent trait analysis (also known as Rasch Analysis) results achieved through the *Quest* statistical program (Adams & Khoo 1993).

In order to answer the research questions the data analysis plan centred around two major foci: group trends and individual case studies:

A. Group Trends (Chapter 5)

Changes over time in the group's responses to the tasks were assessed along with item difficulty. The statistical procedures selected were used on the data collected at the beginning and end of the eighteen month data collection period in 1990/1. The foregoing is completed through the use of Rasch Analysis (Adams & Khoo 1993). Relationships between the various literacy skills were examined in terms of growth through the use of correlations. Literacy growth was measured over the five data collection sessions in 1990/1. Descriptions of group literacy performance in 1995 were completed and comparisons made with performance in 1990/1 through the use of correlations.

B. Individual Case Studies (Chapter 6)

Selected individual case studies were used to illustrate group trends and provide windows on particular aspects of the data. The case studies are also important in themselves as detailed pictures of individual literacy development. The data were examined in a number of ways:

(1) through descriptions of individual performance over time informed by a total of six data gathering sessions in 1990/1 and 1995.

(2) Changes in individual performance over time in each task as revealed by Rasch Analysis (Adams & Khoo 1993).

(3) Performance in 1990/1 compared with performance in 1995.

Details of the procedures used, and their justification follows.

Statistical Procedures: Rasch Analysis

For the purposes of this study, it was considered appropriate to use both quantitative and qualitative ways of analysing the data. Rating Scale Analysis (Wright & Masters 1982), also known as Rasch Analysis, a form of latent trait or latent variable measurement, was deemed suitable for statistical analysis purposes since it was designed to incorporate ordinal data and since it could provide relevant information about the group as a whole and about individuals in that group. Regression analysis was not used because the number of children involved in the study was too small for valid results.

Item analysis was served by Rasch Analysis using the *Quest* software (Adams & Khoo 1993). Individual performance was analysed using the *Quest* software to augment qualitatively oriented analysis.

Latent Trait Measurement Defined

De Vellis (1991, p.13) uses the term "latent variable" to describe an underlying attribute which cannot be observed or quantified directly. Under a specified set of conditions, the underlying attribute is assumed to take on a specific value. This latent variable, as its name implies, is not constant. It is assumed to change in relation to time, place, gender balance and other dimensions. Elaborating, De Vellis says;

> *A scale developed to measure a latent variable is intended to estimate its actual magnitude at the time and place of measurement for each person measured. This unobservable "actual magnitude" is the true score.*
> (De Vellis 1991, p.12 -13)

In relation to this study, and the research questions it posed, the issue of changes over time was important in terms of defining the developing literacy knowledge of the group of children involved.

One of the five statistical models proposed by Wright and Masters (1982) for latent trait analysis was chosen to illuminate the data. Of this family of five models, the *Partial Credit Model* best fitted the form in which the data were expressed and was especially designed for polychotomous data. Adams and Khoo (1993) point out that a more accurate picture of performance is available through apportioning of partial credit through weighted response alternatives in this model. Thus the model is able to give credit for partial attainment in an item when necessary. They provide an example of the implementation of the Partial *Credit Model* for polychotomous data in their *Quest* software (Adams & Khoo, 1993).

The Coding Process for Statistical Analysis

Since it was necessary to code the children's responses to task items for statistical analysis purposes, different approaches had to be considered and the most appropriate selected. Kerlinger (1986, p. 382) defines coding as: "an objective and quantitative method for assigning types of verbal and other data to categories". Cohen and Manion (1994, p. 116) use the term 'data reduction ' Coding facilitates investigation, analysis and reduction of the data and thus, further processing.

There are two major ways indicated by Redden (1995) of classifying children's responses to the items in this study. The first is usually called "pre-coding" (Cohen & Manion 1994) which involves creating hypothesised categories. Closed questions are generally believed to be the best suited to pre-coding, which is assumed to be based on an extensive and detailed knowledge of the field under investigation. When pre-coding is used it is also assumed that the theoretical framework has a predictive ability. Some aspects of this study do fit these criteria, such as the Letter/Sound Identification Task, the Concepts about Print Test (Sand/Concepts about Print Test) and the Neale Analysis. For the other tasks, these criteria for using pre-coded responses fit less well.

Whilst these tasks were certainly based on theoretical constructs which came out of the literature, they were also exploratory in the sense that it was entirely possible, given a group of children culturally different from the mainstream, new, unusual or surprising responses might be expected. Coding needed to be flexible enough to be able to tap into these possible data.

Redden (1995) suggests that "post-coding" suits these latter forms of responses better. When post-coding is used a data frame is developed after the data have been collected. There is less chance of imposing a structure on the data. New responses are added as they are observed. Open-ended questions are considered suitable for post-coding and do not impose the theoretical framework on the responses. The disadvantage of post-coding is that it appears to separate the theoretical framework from the study.

Thus whilst it was useful to examine pre-coding and post-coding to understand the nature of coding itself, this study was concerned with a combination of both kinds of coding in some tasks. Such tasks as the Reading Task and the Writing Task may be called open-ended in the sense that children were simply asked to read or write and the full range of their responses was recorded descriptively. Based on the literature (theoretical framework) from which the task was developed, some responses were expected. Other unexpected or new responses, which appeared to be clearly related to the purposes of the task, were added as the data were examined.

It was not the major purpose of coding in this study to classify responses only as right or wrong as pre-coding techniques frequently imply, although these classifications are certainly used frequently in the study. Since the study tries to describe the nature of the emergent literacy development of a group of children, coding was more concerned with reflecting the range and depth of children's responses than with dichotomous notions of perfection or imperfection (Redden 1995). For example, the Letter/Sound Identification Task and the Environmental Print Task ask only whether responses are correct or

incorrect. However, other tasks such as the Reading Task, the Retell Task, the Writing Task and the Picture Sequencing Task ask whether particular characteristics of certain concepts are observable.

A structure developed by Miles and Huberman (1984) for analysing field notes helped to resolve the above-mentioned problem of theoretical framework separation. They argued that coding intrinsically has three phases: descriptive, interpretive and explanatory. Descriptive codes are recordings of facts at face value and attribute" a class of phenomena to a segment of text "(Miles & Huberman 1984, p. 56). Interpretive coding begins to occur once researchers are familiar with the data and start to recognise deeper understandings that underlie responses. Responses coded in terms of relationships are labelled "explanatory" data.

Masters (1982, p. 150) described partial credit as a method of classifying responses that leads to a more precise estimate of a person's ability than a simple pass/fail description. The allocated number to each category (0,1,2,3,4.....) in the *Quest* application indicates only an ordering of the response categories and is not used as a category weight (Masters 1982, p.150). An additional feature of the partial credit model is that the response alternatives are free to vary in number and structure. The writing task has more variation than other tasks in response alternatives (see later discussion in this chapter).

The ordinal nature of the categories for all tasks except the Writing Task is enunciated in the following way:

1 = no evidence of characteristic or concept
2 = evidence of concept or characteristic.

With the categories for each item in all the tasks ordered as previously described, the data assumptions of the *Quest* application of the Rasch modelling process were consistent with the data for this study. The codes used for this study are essentially descriptive in nature as they relate to the raw data. The coding used enabled Rasch Analysis to interpret the data in a more sophisticated manner than raw scores and frequencies allowed.

The following discussion will define the major statistical procedures used on the data and purposes for using them. Discussion will also explain the *Quest* Program's methods of presentation of the results of statistical operations on the data.

It should be noted at this stage that items and cases which scored zero totals or perfect totals could not be estimated (Adams & Khoo 1993). In tables and appendices based on the information provided by *Quest* to illustrate the operations on the data, items and cases which could not be estimated are indicated and later discussed.

Item Analysis

Item analysis procedures facilitated by *Quest* present the data in a number of ways:

(1) **Item analysis** results for observed responses (tables for each item);

(2) **Summary of item estimates** for each task giving fit statistics, mean and standard deviations and reliability indices;

(3) **Rasch parameter estimates and ranks** (tables of items) which detail item difficulty deltas, item difficulty rankings and fit statistics;

(4) **Item Maps** which plot item difficulty with case distribution;

(5) **StarMaps** of item fit which plot item fit to a latent trait.

The tables of item analysis for observed responses and the summaries of item estimates have not been used to present data in this study since the relevant information contained in them, with the exception of reliability indices for each task, is also to be found in the other data presentation modes.

The item separation reliability indices as defined by Wright and Masters (1982) are reported in the summaries of case estimates. The reliability of estimates for each task is "the proportion of the observed estimate variance that is considered true" (Adams & Khoo 1993, p. 24). These are reported in the analysis of each task.

Rasch Parameter Item Difficulty Over Time: Estimates and Ranks

Documenting shifts in performance of children over time was an important aspect of this study since this was the method used to determine what kind of literacy progress had been made in each task. In addition, the research questions for each of the literacy areas covered in the study asked "Were there changes in group and individual performance and ability over time?" This could be interpreted as "Were there shifts in item difficulty over time?"

Quest (Adams & Khoo 1993) deals with shifts in performance over time in terms of constructs known as item difficulty deltas. The tables showing Rasch Parameter Item Difficulty over Time: Estimates and Ranks present the Items in a task, the item parameter estimates for difficulty (deltas), and the standard error for each parameter.

Table 5.1

Letter/Sound Identification : Rasch Parameter Item Difficulty Estimates and Ranks for the Subscale

Letter/ Sound	Item No	Difficulty Delta	Infit Mean Square	Rank
A	1	-1.46	1.15	1
B	3	.30	.78	14
b	4	.30	1.15	14
f	12	.30	1.20	14
H	15	.65	1.09	17
h	16	1.52	1.26	23
I	17	-0.61	1.17	8
J	19	-0.02	1.29	10
j	20	-0.02	1.20	10
K	21	-0.90	.76	3
M	25	-0.90	.80	3
m	26	-0.90	.82	3
p	32	-0.90	1.16	3
R	35	-0.32	1.05	9
r	36	.02	1.00	13
T	39	-1.18	1.25	2
t	40	-0.90	1.13	3
u	42	2.83	1.09	24
V	43	1.05	.82	19
v	44	1.05	.82	19
W	45	.65	.96	17
x	48	-0.02	.96	10
Y	49	1.05	.82	19
y	50	1.05	.82	19

The resulting rank order of the items based on the parameter estimates is then shown. An example of this using a version slightly adapted for the Letter/Sound Identification Task can be seen in Table 5.1. Tables for all other tasks may be found in Appendix 5.1.

Deltas are the item delta parameters as described by Masters (1982). One delta value is provided for each step, and it describes the conditional probability of succeeding on a step provided the previous step has been passed (Adams & Khoo 1993). Adams and Khoo (1993) state that deltas need not be ordered. For the purposes of this study, item difficulty over time was determined using the data collected in the first and the last data gathering sessions (Session 1 and Session 5).

The fit statistics which appear also in the Rasch parameter estimates and ranks tables provided by *Quest*, are the mean standard deviations of the infit (weighted) and outfit (unweighted) fit statistics in the mean square form. When the observed data and estimates are compatible, the expected value of the mean square is 1. Adams and Khoo (1993, p. 86) reported that:

> *A fit mean square of (1 + X) indicates (100X) percent more variation between the observed and model-predicted response patterns than would be expected if the data and the model were compatible. Similarly, a fit mean square of (1 - X) indicates less variation between the observed and model-predicted response patterns.*

The values of the infit mean squares for each task listed in Table 5.2 reflect good or problematic fits between the data and the model. Infit mean squares at or inside .3 above and below 1 can be interpreted as the data containing few reversals (Adams & Khoo 1993; Redden 1995). A reversal occurs when a child responds at a higher level on a harder item than his or her response level on an easier item.

Wright and Masters (1982) describe the outfit statistic as being sensitive to outlying observations. Thus it can sometimes be distorted by a small number of unusual observations. The infit statistic is more reliable than the outfit, and is closely related to item or case discrimination. Infit and outfit values will be similar in most cases (Adams & Khoo 1993). For the reasons outlined above, the discussions of data for this study use only the infit mean squares.

The tests of model fit are sensitive to sample size, especially in their normalised form (Adams & Khoo 1993). Thus, using the mean square fit statistics as effect measures is often a useful way of examining the compatibility of the model and the data. Table 5.2

lists the infit mean squares for each task and shows that the data for each task exhibits few reversals.

StarMaps of Item Fit

The item infit mean square values also appear on the StarMaps of item fit. The StarMap for the Environmental Print Task is provided as an example in Figure 5.1. StarMaps of item fit for all tasks may be found in Appendix 5.2. The figures on the horizontal scale represent the infit mean square scale and the asterisks indicate the magnitude of the fit statistic for the item on the same line. The vertical dotted line on the right indicates a mean square that is 30% (.3) above its expected value, and the dotted line on the left indicates a mean square that is 30% (.3) below its expected value. Adams and Khoo (1993) suggest that these parameters provide basic 'rules of thumb' for determining the adequacy of item fit to the model. Fit statistics that lie within the two dotted vertical lines are considered acceptable. The items which fit between the two dotted lines may be said to represent aspects of the latent variable(Adams & Khoo 1993).

Table 5.2

Infit Mean Squares for Each Task

NB. The ideal value of the Infit mean Square is 1

Task	Infit Mean Square
Environ Print	.93
Letter ID	.98
Pic Sequence	.95
Reading	.98
Retell	1.00
Sand Test	.97
Writing	1.01

Item Maps

Quest software presents item maps for each task. An item map for the Letter/Sound Identification Task is provided as an example in Figure 5.2 and the item maps for all tasks are to be found in Appendix 5.3. These maps provide a sequence of item difficulty over time and a histogram of the children's response frequencies for each level of difficulty in that particular task. The maps consist of distribution on a logit scale (figures on the extreme left) to which both items and cases are calibrated. Each X represents one child and all the X's show the distribution of case estimates over the logit

scale. The figures on the right-hand side of the map show the items plotted according to their difficulty.

```
-----------------------------------------------------------------------------------------
Item Fit
all on all (N = 49 L = 36 Probability Level= .50)
-----------------------------------------------------------------------------------------
INFIT
 MNSQ        .23        .31        .48       1.00       2.10       3.20       4.30
--------------+---------+---------+---------+---------+---------+---------+---------+-----
  1 item 1                                  .* |  .
  2 item 2                                  .  |  *
  3 item 3                                  .  *  .
  4 item 4                                  .  |* .
  5 item 5                                 *.  |  .
  7 item 7                                  .  *  .
  8 item 8                                  .  *  .
  9 item 9                                  .  *  .
 10 item 10                                 .  *  .
 11 item 11                                 .  | *.
 12 item 12                                 .  *  .
 13 item 13                                 .* |  .
 14 item 14                                 .* |  .
 15 item 15                                 .* |  .
 16 item 16                                 . *|  .
 17 item 17                                *.  |  .
 18 item 18                                 .* |  .
 19 item 19                                 . *|  .
 20 item 20                                 . *|  .
 21 item 21                                 .  |* .
 22 item 22                                 .* |  .
 23 item 23                                 .* |  .
 24 item 24                                 . *|  .
 25 item 25                                 .* |  .
 26 item 2*                                 .  |  .
 27 item 27                                 .  | *.
 28 item 28                                 .* |  .
 29 item 29                                *.  |  .
 30 item 30                                 .  |* .
 31 item 31                                 .  |* .
 32 item 32                                 .  |  .*
 33 item 33                                 .  *  .
 34 item 34                                 . *|  .
 35 item 35                                *.  |  .
 36 item 36                                 .* |  .
=========================================================================
```

Figure 5.1

Environmental Print Task: StarMap of Item Fit

```
-----------------------------------------------------------------------------------------
Item Estimates (Thresholds)
all on all (N = 49 L = 54 Probability Level= .50)
-----------------------------------------------------------------------------------------
  5.0                           |
                                |      34
                            X   |
                                |
                                |
  5.0                           |
                                |
                                |
                           XX   |
                                |
  4.0                           |
                            X   |
                                |
                                |
                                |
  3.0                       X   |
                                |      14     42
                            X   |
                                |
                                |      33     41
  2.0                           |
                                |
                                |      16     28     54
                                |
                                |       8     27     43     44     49
  1.0                           |
                            X   |      15     45
                            X   |
                                |       3      4      9     12     47
                            X   |
   .0                       X   |      10     11     13     18     19
                           XX   |
                            X   |      31     35     46
                            X   |       7     17
                            X   |
 -1.0                           |       2     21     22     25     26
                            X   |      39
                                |
                                |       1     30
                            X   |       5     29     52
 -2.0                           |
                                |      51
                                |       6
                            X   |
                            X   |      37     38
 -3.0                      XX   |
                           XX   |
                                |
                                |
                                |
 -4.0                    XXXXX  |
                                |
                                |
                                |
                          XXX   |
 -5.0                           |
-----------------------------------------------------------------------------------------
 Each X represents     1 students NB Some items could not be fitted to the display
```

Figure 5.2

Letter/Sound Identification Task: Map of Item Difficulty

Case Analysis

Case analysis procedures facilitated by *Quest* present the data in a number of ways:

(1) a **case estimate summary** which provides fit statistics for the group as a whole, reliability indices for this information and mean and standard deviations;

(2) **case estimate tables** which display raw scores, ability estimates and infit mean squares for each child;

(3) **KidMaps** of individual performance which plot the items at the child's level of difficulty, show a percentage score for the task and an ability estimate for the child.

The case estimate summary table has not been displayed in the data analysis although the information it supplies is referred to when necessary.

Case Estimates

The *Quest* software produces tables of case estimates as in the example provided in Table 5.3. The SCORE simply records the frequency of correct answers by individuals and calculates the number of correct answers against a possible perfect score (MAXSCR). ESTIMATE is the case parameter estimate, and ERROR is its standard error. These estimates provided ability rankings which were used in the selection of the individual case studies. The INFIT MNSQ and OUTFT MNSQ and the INFT t and OUTFT t values are expressions of the fit of the case to the model (Adams & Khoo 1993). If the item fits the model, both the infit and outfit mean squares have expected values of 1 and the infit and outfit t-values have expected values of zero. The case estimates for all tasks are found in Appendix 5.15.

KidMaps

The *Quest* software also provides data concerning individual children in the form of KidMaps. They were appropriate to use where the performances of individual children were examined. KidMaps produced by the *Quest* software indicate the ability estimate of the child (shown as XXX), with parameters drawn at plus and minus one standard error. Examples of KidMaps are provided in Appendix 6.1. Items are plotted at their difficulty level on a vertical scale calibrated in logits. Items are plotted on the left side of the map if the child scored positively and on the right if the child did not score positively. If a child's response patterns are in line with the model, it is expected that the majority of the items below the ability estimate (indicated by the three XXX's) of the

Table 5.3
Letter/Sound Identification Task: Case Estimates

Case Estimates In input Order
all on all (N = 22 L = 108 Probability level = .50

NAME	SCORE	MAXSCR	ESTIMATE	ERROR	INFIT MEANSQ
1 Al	50	85	.67	.4	.78
2 Am	7	85	-4.82	.45	1.42
3 Ca	81	85	5.96	.45	.99
4 Cl	35	85	-1.41	.33	1.09
5 Da	17	85	-3.33	.34	.91
6 De	23	85	-2.66	.32	.77
7 Ga	50	85	.67	.43	.53
8 Gr	5	85	-5.29	.51	1.47
9 Ge	46	85	- .01	.39	.88
10 Ja	25	85	-2.45	.32	1.07
11 Ka	51	85	.86	.44	.37
12 kg	51	85	.86	.44	.35
13 Ki	22	85	-2.77	.33	.90
14 Li	28	85	-2.14	.32	.83
15 Lu	4	85	-5.57	.56	1.06
16 Ma	20	85	-2.98	.33	.85
17 Pa	7	85	-4.82	.45	.67
18 Sa	28	85	-2.14	.32	.94
19 St	6	85	-5.04	.48	.76
20 Ta	13	85	-3.84	.37	1.13
21 To	34	85	-1.52	.33	.95
22 Wa	7	85	-4.82	.45	1.62
Mean			-2.12		.93
SD			2.78		.32

child will appear on the left side of the map. The majority of items above the ability estimate of the case will be plotted on the right side of the map (Adams & Khoo 1993). KidMaps are used for various purposes in the data analysis such as to compare and contrast performance of individuals, to supplement qualitative analysis of children's performance over time and to illustrate individual performance in particular tasks. They are chiefly used in this chapter to depict individual performance in a task. KidMaps for each of the children in the five case studies (Chapter 6) may be found in Appendix 6.1.

Information provided by the KidMaps applies to the 1990/1 data gathering sessions only since Rasch Analysis was not suitable for the data collected in 1995.

Methods of Entering the Data on Spreadsheets

For the purposes of longitudinal analysis with varying numbers of cases, sometimes the children's names were entered vertically on the spreadsheet twice (Environmental Print Task and Letter/Sound Identification Task) eg Carl 1, Carl 5 represents Carl's responses for S1, Carl's responses for S5. When data have been entered in this way, there is only one set of items (entered horizontally on the spreadsheet). Data were entered this way to enable inclusion for processing of responses for children with incomplete sets of data. Thus investigating changes in children's abilities across time as measured by case estimates was facilitated.

Table 5.4

Examples of Two Methods of Entering Responses on a Spreadsheet

Example One: For Investigating Changes in Case Estimates

Figures after children's names identify the session

Case	Item 1	Item 2	Item 3
Alex 1			
Amelia 1			
Carl 1			
Graham 1			
Alex 5			
Carl 5			

Example Two: For Investigating Changes in Item Difficulty Latent Trait Indications

Figures in brackets identify the session. Item 1(1) and Item 1(5) are the same items in Session 1 and Session 5 .

Case	Item 1(1)	Item 2(1)	Item 3(1)	Item 4(5)	Item 1(5)	Item 2(5)
Alex						
Amelia						
Carl						
Graham						

At other times (Picture Sequencing Task, Reading Task, Retell Task, Sand/Concepts about Print Test, Writing Task), the children were entered vertically on the spreadsheet only once and the items (responses for Sessions One and Five) were entered horizontally twice (see Table 5.4). Whilst there may have been only three items in a task for example, six items appear on the spreadsheet to take account of responses for both sessions. This facilitated investigating changes in responses to items across time as measured by item difficulty deltas and latent trait analysis. In this way of entering the data, only the data for the children who completed both S1 and S5 can be included.

Thus the responses for a maximum of twenty-two children were involved in calculations when data were entered this way.

Table 5.4 illustrates the two methods of entering responses on a spreadsheet for processing via *Quest.*

Correlations

There was benefit in ascertaining whether relationships existed between responses to the various tasks. Correlations on the tasks were completed using data from the 18 children for whom a complete set of data existed (1990/1 & 1995). For the purposes of this study the critical values of the Pearson product moment correlation co-efficient were used to determine the level of significance of .47 (Burns 1995). Rasch Analysis was completed only on the 1990/1 tasks using information from the 22 children for whom a complete set of data existed.

The 1990/1 Tasks

The Environmental Print Task

Recap of the Nature of the Task

As Chapter 4 described in more detail, the Environmental Print Task involved the completion of three supposedly related phases. In Phase One, children were shown twelve objects commonly bought in supermarkets and asked to read the name of the object. In Phase Two the logo was decontextualised from the object and presented on paper to the children who were asked to read the name. In Phase Three the name on the logo was simply printed and the children asked to read it.

For example:

Phase One	A Coke Bottle (the actual bottle)
Phase Two	Coca Cola Label (in black & white)
Phase Three	Coca Cola (in plain print)

The Environmental Print Task addressed a number of sections of Research Question One:

1.2 What kind of knowledge do the children have about environmental print?

1.2.1 Is their print knowledge chiefly related to logographic reading knowledge?

1.2.2 Are the children able to identify words in print automatically in the manner of conventional reading ?

1.2.3 Is their ability to read print chiefly related to the use of a combination of logographic and grapho-phonic cues?

1.2.4 Are there changes over time?

2. Is the literacy knowledge they possessed in pre-school and early primary school related to the literacy knowledge they possess in middle primary school?

2.2 Is the literacy knowledge this group of children displayed in pre-school consistent with their literacy development in middle primary school?

Coding

Responses for all three phases of this task were coded in a simple format: 1 = incorrect; 2 = correct. The 36 columns used to record the item responses contained all three twelve-item phases in the task. Responses for each phase were recorded in the same order. Items 1 - 36 = Session 1; Items 37 - 72 = Session 5.

Item numbers are listed below for easy interpretation of StarMaps and Item Maps.

Phase One

Item 1(37) = Colgate1
Item 2(38) = McDonald's1
Item 3(39) = Milo1
Item 4(40) = Weet-Bix1
Item 5(41) = Quik1
Item 6(42) = Milk1
Item 7(43) = Coco Pops1
Item 8(44) = Coca Cola1
Item 9(45) = Corn Flakes1
Item 10(46) = Vegemite1
Item 11(47) = Rice Bubbles1
Item 12(48) = Mars1

Phase Two

Item(49) 13 = Colgate2
Item(50) 14 = McDonald's2

Item 15(51) = Milo2
Item 16(52) = Weet-Bix2
Item 17(53) = Quik2
Item 18(54) = Milk2
Item 19(55) = Coco Pops2
Item 20(56) = Coca Cola2
Item 21(57) = Corn Flakes2
Item 22(58) = Vegemite2
Item 23(59) = Rice Bubbles2
Item 24(60) = Mars2

Phase Three
Item 25(61) = Colgate3
Item 26(62) = McDonald's3
Item 27(63) = Milo3
Item 28(64) = Weet-Bix3
Item 29(65) = Quik3
Item 30(66) = Milk3
Item 31(67) = Coco Pops3
Item 32(68) = Coca Cola3
Item 33(69) = Corn Flakes3
Item 34(70) = Vegemite3
Item 35(71) = Rice Bubbles3
Item 36(72) = Mars3

Analysis

Mean Scores

Each child's performance in the three phases of the task was examined in terms of correct responses in Sessions 1 and 5 (see Appendix 5.4 and Appendix 5.5). Group performance was tabulated for each item and each phase and scores calculated (see Appendix 5.6 and Appendix 5.5).

Table 5.5 shows the means for each phase of the task in S1 and S5 using the responses of the 22 children who completed both sessions. Improvements in mean scores are lowest in Phase One, higher in Phase Two and highest in Phase Three. The smaller difference in performance between Phase One and Phase Two as opposed to Phase Two and Phase Three may reflect the pictorial cues provided by the logos in Phase Two. Improvements in Phases Two and Three over the eighteen month data gathering (differences between S1 results and S5 results) period could indicate some movement

Table 5.5
Environmental Print Task: Mean Scores

NB 12 items in each phase

Session	Phase 1	Phase 2	Phase 3
One	5.90	5.86	0.36
Five	7.77	7.81	2.40

towards conventional reading. The results could also be a function of the fact that there was more room for improvement in the latter two phases. It is less easy to get group improvement if the group does well the first time. These speculations were examined further for confirmation through Rasch Analysis.

Rasch Analysis

The summary of fit statistics (Appendix 5.7) for the Environmental Print Task shows an infit mean square of 0.93 and a reliability estimate of 0.95 indicating few reversals in the data.

Examination of the StarMap of Item Fit (see Figure 5.1) for the Environmental Print Task shows that all items except two cluster between the latent trait only item in the three phases of the task which all children got correct. Rankings of item difficulty in Table 5.6 indicated that the following ten items, all from Phases One and Two were the easiest for the children to get correct: Item 6 (Milk1), Item 18 (Milk2), Item 8 (Coca Cola1), Item 14 (McDonald's2), Item 4 (Weet-Bix1), Item 10 (Vegemite 1), Item 20 (Coca Cola2), Item 15 (Milo2), Item 3 (Milo1) and Item 2 (McDonald's1). Some items were obviously less familiar to children right across the eighteen month period of testing. Notably, these were *Quik, Mars* and *Colgate.*

The other item which fell well outside latent trait parameters on the StarMap, Item 26, occurred in Phase Three of the task where children were presented with the printed word. The word was *McDonald's*. If the frequency tables for the Environmental Print Task are examined (see Appendix 5.6) the Phase Three responses for McDonald's are lower than the other eleven items. Given that the responses in logographic reading of *McDonald's* in Phases One and Two (Items Two and Fourteen) had some of the highest correct recognition rates, this item most clearly illustrates the fact that the children as a group were not able to identify single words automatically without other supports or aids to recognition. Rasch parameter item difficulty estimates and ranks (see Table 5.6) for this task confirm the above and *McDonald's* in Phase Three is ranked as the most

Table 5.6

Environmental Print Task: Rasch Parameter Item Difficulty Over Time: Estimates and Ranks

Item	Difficulty Delta	Infit Mean Square	Rank
1	2.21	.80	23
2	-2.64	1.33	10
3	-2.81	.98	9
4	-4.05	1.10	5
5	2.55	.71	27
6	Item has	Perfect Score	1
7	-1.18	1.05	16
8	-4.51	1.05	3
9	-1.78	.96	14
10	-4.05	1.03	5
11	-1.18	1.24	16
12	3.00	.97	32
13	2.21	.80	23
14	-4.51	.85	3
15	-3.00	.83	8
16	-0.37	.89	18
17	2.55	.71	27
18	-5.24	.82	2
19	-2.04	.93	12
20	-3.21	.93	7
21	-1.29	1.11	15
22	-2.18	.83	11
23	-1.29	.83	12
24	3.68	.89	34
25	3.00	.79	32
26	4.96	.21	36
27	1.93	1.25	22
28	1.28	.83	21
29	2.55	.71	27
30	1.10	1.11	19
31	1.10	1.13	19
32	2.21	1.40	23
33	2.55	1.03	27
34	2.21	.89	23
35	2.55	.72	27
36	3.68	.81	34

Table 5.7
Environmental Print Task: Item Difficulty Rankings

NB Figures 1, 2 & 3 after items = phase number

Ranking	Item & Phase
1	Milk1
2	Milk2
3	Coca Cola1
3	McDonald's2
5	Vegemite1
5	Weet-Bix1
7	Coca Cola2
8	Milo2
9	Milo1
10	McDonald's1
11	Vegemite2
12	RiceBubbles2
12	Coco Pops2
14	Corn Flakes1
15	Corn Flakes2
16	Coco Pops1
16	Rice Bubbles1
18	Weet-Bix2
19	Milk3
19	Coco Pops3
21	Weet-Bix3
22	Milo3
23	Colgate1
23	Colgate2
23	Coca Cola3
23	Vegemite3
27	Corn Flakes3
27	Rice Bubbles3
27	Quik1
27	Quik2
27	Quik3
32	Mars1
32	Colgate3
34	Mars2
34	Mars3
36	McDonald's3

```
                NB Figures 1, 2 & 3 after items = phase number
-------------------------------------------------------------------------------
Item Estimates
all on all (N = 49 L = 36 Probability Level= .50)
-------------------------------------------------------------------------------
 5.0                          |     26 (McDonald's3)
                              |
                              |
                              |
                              |
                              |
                              |
                              |
 4.0                          |
                              |
                              |     24(Mars2)     36(Mars3)
                              |
                              |
                              |
                              |
 3.0                          |     12(Mars1)     25(Colgate3)
                              |
                              |
                              |
                          X   | 5(Quik11) 17(Quik2) 29(Quik3)  33(Corn Flakes3) 35(RiceBub3)
                              |
                              |    1 (Colgate1)  13 (Colgate2)  32 (Coca Cola3) 34 (Vegemite3)
                              |
 2.0                          |
                              |     27 (Milo3)
                              |
                          X   |
                              |
                          X   |     28 (Weet-Bix3)
                              |
                              |     30 (Milk3)    31 (Coco Pops3)
 1.0                     XXXX |
                              |
                          X   |
                              |
                         XX   |
                              |
                       XXXXX  |
  .0                          |
                              |
                       XXXXX  |
                              |     16 (Weet-Bix2)
                              |
                        XXX   |
                              |
-1.0                   XXXXXX |
                              |     7 (Coco Pops1)    11 (Rice Bubbles1)
                         XX   |     21 (Corn Flakes2)     23 (Rice Bubbles2)
                              |
                        XXX   |
                              |
                              |     9 (Corn Flakes1)
                       XXXX   |
-2.0                          |     19 (Coco Pops2)
                        XXX   |     22 (Vegemite2)
                              |
                              |
                         XX   |
                              |     2 (McDonald's1)
                              |     3 (Milo1)
                        XXX   |
-3.0                          |     15 (Milo2)
                              |     20 (Coco Cola2)
                              |
                              |
                          X   |
                              |
                              |
                              |
-4.0                          |
-------------------------------------------------------------------------------
 Each X represents    1 students
```

Figure 5.3

Environmental Print Task: Map of Item Difficulty

difficult item (36th) with the highest delta score of 4.96 and an infit mean square of only .21. This is best illustrated in the item map for this task (see Figure 5.3 EPT).

Correlations with 1990/91 Tasks

The Environmental Print Task (EPT) was correlated with a range of other literacy tasks undertaken by the children (Letter Identification S1-S5, Reading S1-S5, and Sand/Concepts about Print Test S1-S5). Children scored virtually zero in Phase Three of S1 (8/264), S2 (6/264), S3 (7/264) and S4 (20/264) and these correlations have been excluded from the correlation matrix on that basis (see Table 5.8).

As explained earlier .47 is the critical value for the level of significance in all following correlation matrices.

The EPT was also correlated with results of the tasks completed in 1995 (Neale Analysis, Comprehensions One and Two, the Title Recognition Test and the Writing Task) when the children were in middle primary school (see Table 5.15 and later discussion).

Table 5.8

Correlation Matrix: Environmental Print Task, Sessions 1 - 5

* Figures in Italics represent significant correlations for the number of subjects.

Session/ Task	EPT 1/1	EPT 1/2	EPT2 /1	EPT 2/2	EPT3 /1	EPT 3/2	EPT 4/1	EPT 4/2	EPT5 /1	EPT5 /2	EPT5 /3
EPT 1/1	1										
EPT 1/2	*.77*	1									
EPT2/1	.23	.31	1								
EPT 2/2	.31	*.51*	*.93*	1							
EPT3/1	*.79*	*.63*	.13	.25	1						
EPT 3/2	*.53*	*.60*	-.02	.19	*.79*	1					
EPT 4/1	*.57*	*.48*	-.05	.12	*.92*	*.87*	1				
EPT 4/2	*.52*	*.57*	.12	.24	*.84*	*.92*	*.91*	1			
EPT 5/1	*.86*	*.77*	.24	.42	*.72*	*.59*	*.57*	*.56*	1		
EPT 5/2	*.72*	*.82*	.23	.46	*.70*	*.74*	*.62*	*.70*	*.86*	1	
EPT 5/3	.30	.42	0	.16	*.48*	.43	*.59*	*.56*	*.52*	*.56*	1

Phase One of the first data gathering session of the Environmental Print Task (EPT 1/1) correlated highly with Phase Two (EPT 1/2) of the same session. Phases One and Two of the EPT in S1 correlated significantly with EPT 3/1, EPT 3/2, EPT 4/1, EPT 4/2 and EPT 5/1 and EPT 5/2 but not significantly with EPT 5/3. All of these relationships concern aspects of logographic reading and thus significant relationships are to be expected between them. A marked relationship is indicated between logographic reading in the middle of the children's pre-school year and logographic reading at the end of their Kindergarten year.

EPT 1/1 and 1/2 do not correlate significantly with EPT 5/3 underlining further the idea that there are, at this stage, in the middle of the children's pre-school year, few connections between logographic reading knowledge and grapho-phonic reading knowledge. Thus decontextualised reading in S5 appears to be a different kind of skill from logographic reading and not derived from it. This also supports earlier evidence presented in Chapters Two and Three, and later evidence in the Rasch Analysis that, in the middle of their pre-school year, children's literacy knowledge is minimal. There are, however, high correlations between EPT 1/2 and EPT 5/1 and EPT 5/2 indicating a marked relationship between logographic reading in the middle of the pre-school year and logographic reading at the end of the children's Kindergarten year eighteen months later.

EPT 3/1 and EPT 3/2 correlate very highly with EPT 4/1, 4/2, 5/1 and 5/2. This further demonstrates the close relationships between Phase One and Phase Two of the EPT in all sessions. As might be expected there are no significant correlations between EPT 3/1, 3/2 and 5/3 since the former two deal with logographic reading and the latter with grapho-phonic reading. EPT 4/1 and EPT 4/2 correlate significantly with all Phases of S5.

Relationships between EPT 5/1 and EPT 5/2 and EPT 5/3 show significant correlations, supporting the validity of the task. Similarly the correlation between EPT 5/2 and EPT 5/3 at the end of Kindergarten year indicates a substantial relationship between the two phases. Thus relationships between all three phases of the EPT are substantial to marked.

Table 5.9 shows the correlations between the EPT and the Letter Identification Task. There were no significant correlations between the EPT in S1 and Letter Identification S1, S2 and S3. This leads to the conclusion that the negligible relationship indicated is a result of the fact that children's grapho-phonic knowledge and their ability to read decontextualised print as shown by the Rasch Analysis earlier was minimal at this stage.

Table 5.9
Correlation Matrix: Environmental Print Task Sessions 1 - 5 and Letter Identification Task, Sessions 1 - 5

Session/Task	EPT 1/1	EPT 1/2	EPT 2/1	EPT 2/2	EPT 3/1	EPT 3/2	EPT 4/1	EPT 4/2	EPT 5/1	EPT 5/2	EPT 5/3
Let ID 1	.30	.31	.18	.32	.30	.31	.39	.32	***.57***	***.48***	***.70***
Let ID 2	.27	.35	.25	.41	.34	.34	.42	.36	***.59***	***.51***	***.74***
Let ID 3	.30	.37	.20	.38	-.13	.37	.46	.40	***.62***	***.54***	***.78***
Let ID 4	***.48***	***.58***	-.16	.08	**.56**	**.64**	**.59**	**.60**	***.67***	***.75***	***.73***
Let ID 5	.45	***.55***	-.12	.1	***.66***	***.66***	***.65***	***.66***	***.64***	***.72***	***.64***

EPT 1/1 correlated significantly with Letter Identification S4 indicating a moderate relationship. EPT 1/2 (logographic reading) correlates significantly with Letter Identification S4 and S5. Thus, whilst the correlations are not marked, both EPT 1/1 and 1/2 show clear relationships to Letter Identification competence after the children have had formal literacy instruction for 6 - 10 months. It appears that some element of logographic reading, possibly a pictorial shape identification aspect, has a connection to later performance in letter identification although such a contention would need further investigation.

The Environmental Print Task 5/1, 5/2 and 5/3 at the end of the children's Kindergarten year correlated significantly with all sessions in the letter Identification Task (see Table 5.9). Thus letter knowledge after 6 -10 months of formal school instruction (Letter ID S4 & S5) also showed substantial to marked relationships (See Table 5.9) with the ability to read decontextualised print at the end of the Kindergarten year. By the end of their Kindergarten year reading brand names on commercial products (in context) was more dependent on "decoding-type" skills, including letter knowledge, than it was in pre-school.

This leads to the conclusion that, over the eighteen month period, which included a year at primary school, the children's interaction with print changed in a significant way. Their performance in the three phases of the Environmental Print Task interacted significantly with changes in Letter Identification Task performance. Such observations of the data indicate that Phase Three of the Environmental Print Task may be a good predictor of later competence in letter knowledge. There are clear indications also that schooling did make a difference to the literacy knowledge of these children.

Correlations relating the EPT to the Reading Task (RT) (see Table 5.10) show highest correlations between EPT 5/3 and the RT S4 and S5. The fourth and fifth data gathering sessions were those conducted in the last six months of the children's Kindergarten year when they might be expected to show evidence of increasing literacy knowledge as a result of literacy teaching occurring at school. Significant relationships between RT S5 and the EPT begin to occur as early as EPT 3/1.

Table 5.10
Correlation Matrix: Environmental Print Task, Sessions 1 - 5 and Reading Task, Sessions 1 - 5

Session/Task	EPT 1/1	EPT 1/2	EPT 2/1	EPT 2/2	EPT 3/1	EPT 3/2	EPT 4/1	EPT 4/2	EPT 5/1	EPT 5/2	EPT 5/3
Read 1	.28	.27	-.31	-.18	.44	.42	.39	.35	.38	.29	.10
Read 2	.28	.39	-.27	-.28	.29	.30	.28	.31	.03	.17	.09
Read 3	-.12	.24	.05	.13	-.10	.11	.02	.19	-.03	.03	.16
Read 4	.20	***.51***	-.10	.07	.15	.28	.27	.25	.36	.36	***.69***
Read 5	.20	.28	.06	.23	***.51***	***.51***	***.60***	***.58***	.45	***.52***	***.81***

Thus, as may be expected, the children's ability to read decontextualised print in the latter half of their Kindergarten year became markedly related to their reading skills at this time. The EPT 5/2 performance (logographic/grapho-phonic reading) also shows a moderate relationship with the children's reading performance at the end of Kindergarten.

The first sessions of the Sand/Concepts about Print Test and the EPT appear only peripherally related and may reflect the minimal literacy knowledge which this group of children had in the middle of their pre-school year.

Correlations relating the EPT to the Sand/Concepts about Print Test (see Table 5.11) show that the strongest relationships occur between EPT 5/3 and the Sand/Concepts about Print Test S2 -S5. Thus the Sand/Concepts about Print Test (S2-S5) showed consistently significant correlations with all phases of the Environmental Print Task in S5 (see Table 5.11). The low correlation of EPT 5/3 with Sand/Concepts about Print Test S1 shows, as may be expected given the lack of formal literacy instruction at this stage, that the children's print knowledge in the middle of their pre-school year was

Table 5.11
Correlation Matrix: Environmental Print Task, Sessions 1 - 5 and the Sand/Concepts about Print Test, Sessions 1 - 5

Session/Task	EPT 1/1	EPT 1/2	EPT 2/1	EPT 2/2	EPT 3/1	EPT 3/2	EPT 4/1	EPT 4/2	EPT 5/1	EPT 5/2	EPT 5/3
Sand 1	.45	.42	.20	.25	.32	.26	.25	.27	***.58***	.33	.34
Sand 2	.39	***.49***	.11	.30	.45	***.54***	***.54***	***.50***	***.65***	***.55***	***.63***
Sand 3	.36	***.49***	.37	***.51***	***.47***	.37	***.50***	***.49***	***.58***	***.47***	***.67***
Sand 4	.39	***.50***	-.03	.18	***.60***	***.59***	***.70***	***.67***	***.58***	***.63***	***.86***
Sand 5	.36	***.49***	.02	.18	***.54***	***.58***	***.59***	***.66***	***.60***	***.63***	***.80***

only slightly related to their ability to read decontextualised print, supporting the speculation that their print knowledge was minimal (see Rasch Analysis earlier). As with the Reading Task, the highest correlations were recorded between EPT 5/3 and S4 and S5 of the Sand/Concepts about Print Test further supporting the inference that school literacy learning was affecting results. It should be remembered, however, that maturation and other influences may have played a part in these results. If, Clay (1979a; 1979c) maintains, the Sand/Concepts about Print Test, gives information about exposure to books and print, then these results lead to the conclusion that print exposure fosters important skills concerned with decontextualised reading.

As early as the end of their pre-school year, the children's knowledge of print concepts was interacting significantly with their ability to read decontextualised print. Thus the knowledge which this group of children had about print was clearly related to their logographic knowledge, their grapho-phonic knowledge, and their ability to read decontextualised print at the end of their Kindergarten year.

Relationships between the Picture Sequencing Task and the EPT are less clear and call into question the validity of the Picture Sequencing task because of the apparent randomness of responses to the items (see Table 5.12). Most significant relationships appear between EPT 3/1 onwards and PS 3 onwards. In particular, there appears to be a clear connection between logographic reading (see EPT 3/1, 3/2, 4/1 and 4/2) and picture sequencing (PS 3, PS 4 and PS 5) leading to the speculation that the pictorial aspects of these two tasks are related. Supporting this, EPT 5/2 (logographic reading) relates significantly to all sessions of the Picture Sequencing Task. As the children learn more about literacy, however, it appears that the relationships become weaker as

examination of the relationships between EPT 5/3 (decontextualised reading) and the PS Task (S1-S5) illustrate.

Table 5.12
Correlation Matrix: Environmental Print Task, Sessions 1 - 5 and the Picture Sequencing Task, Sessions 1 - 5

Sess/ Task	EPT 1/1	EPT 1/2	EPT 2/1	EPT 2/2	EPT 3/1	EPT 3/2	EPT 4/1	EPT 4/2	EPT 5/1	EPT 5/2	EPT 5/3
PS 1	.15	.26	.23	.44	.46	***.53***	***.49***	.46	.33	***.52***	.33
PS 2	.28	***.46***	***. 64***	***.76***	.43	.33	.36	.40	.31	***.47***	.35
PS 3	.37	.36	-.02	.10	***.61***	***.75***	***.66***	***.71***	.41	***.56***	***.49***
PS 4	.37	.26	.01	.07	***.70***	***.69***	***.74***	***.72***	.32	***.48***	.43
PS 5	***.63***	.43	-.11	.01	***.90***	***.67***	***.88***	***.72***	***.58***	***.58***	***.54***

Significant relationships between the Retell Task and the EPT cluster between Retell S3 - S5 and EPT 3/1 - 4/2 (all logographic reading) (see Table 5.13). Thus it appears that logographic reading in the early part of the children's Kindergarten year was related to their ability to retell a story in their Kindergarten year. The nature of this relationship is unclear and may simply be accidental or random. Relationships between the Retell Task and the EPT S5 are also ambiguous, the only significant ones occurring between Retell S4 and EPT 5/1, 5/2 and 5/3. Such results do not allow for any firm conclusions about relationships between decontextualised reading and retelling skills. They may also reflect some kind of cultural difference between Aboriginal and Western story structure as discussed in Chapter 3.

Table 5.13
Correlation Matrix: Environmental Print Task, Sessions 1 - 5 and the Retell Task, Sessions 1 - 5

Sess/ Task	EPT 1/1	EPT 1/2	EPT 2/1	EPT 2/2	EPT 3/1	EPT 3/2	EPT 4/1	EPT 4/2	EPT 5/1	EPT 5/2	EPT 5/3
Ret1	.22	.37	.23	.27	***.58***	***.50***	***.62***	***.67***	.25	.30	.42
Ret 2	-.06	.18	***.59***	***.59***	.09	.15	.14	.24	-.04	.18	.20
Ret 3	.30	.27	-.07	-.03	***.52***	***.56***	***.53***	***.55***	.21	.33	-.05
Ret 4	***.64***	.64	.09	.26	***.85***	***.68***	***.82***	***.77***	***.69***	***.71***	***.61***
Ret 5	***.49***	.21	-.29	-.20	***.74***	***.72***	***.79***	***.67***	.43	.43	.29

Table 5.14
Correlation Matrix: Environmental Print Task, Sessions 1 - 5 and the Writing Task, Sessions 1 - 5

Sess/ Task	EPT 1/1	EPT 1/2	EPT 2/1	EPT 2/2	EPT 3/1	EPT 3/2	EPT 4/1	EPT 4/2	EPT 5/1	EPT 5/2	EPT 5/3
WT 1	-.09	.10	-.02	-.05	.14	.12	.22	.24	-.09	-.04	.20
WT 2	.12	.02	.13	-.03	.01	-.19	-.06	-.02	.06	-.07	.15
WT3	.03	.02	.21	.08	-.07	-.08	-.08	. 08	-.04	.03	.07
WT 4	.17	.40	.03	.17	.34	.38	***.50***	***.54***	.31	***.47***	***.70***
WT5	.11	.15	-.11	-.14	.36	.34	***.48***	***.55***	.07	.01	.44

Relationships between the EPT and the Writing Task are tenuous at best (see Table 5.14) and patterns do not allow any firm conclusions to be made. Low correlations, however, can also tell a story. In this case, it may be that literacy skills were not at a sufficiently developed level to reflect the connections between reading and writing. Certainly, such a contention is borne out by performances in other tasks such as the Reading Task and the Letter Identification Task.

Correlations with 1995 Tasks

The Rasch Analysis (see discussion earlier) confirms that children's knowledge of reading in the middle of their pre-school year was minimal. Neale Analysis scores five years later (see later discussion in this chapter) placed most children in this group well below the reading norms for their ages. The EPT appears to be able to predict the reading competence of these children in middle primary school by their Kindergarten year as shown in the following discussion.

Correlations between the EPT 5/1, 5/2 and 5/3 and the Neale Analysis of Reading Ability (1995 data gathering) showed consistently significant figures (see Table 5.15). Thus a substantial relationship is indicated between the logographic and grapho-phonic aspects of reading as determined in the EPT at the end of the children's Kindergarten year and their reading rate, accuracy and comprehension four years later in middle primary school. For example, the ability to read decontextualised print at the end of Kindergarten year (EPT 5/3) shows a marked relationship to reading accuracy as determined by the Neale Analysis. Thus the EPT appears to be able to predict the reading competence of this group of children in middle primary school, at the end of their kindergarten year. This long-term relationship has important ramifications for

teachers and schools as an indicator of reading difficulty in later childhood as will be elaborated on in later discussion.

Table 5.15

Correlation Matrix: Environmental Print Task, Sessions 1 - 5 and the Neale Analysis of Reading Ability, Comprehensions One and Two, the Title Recognition Test and the Free-Writing Task

Session/ Task	EPT 1/1	EPT 1/2	EPT 2/1	EPT 2/2	EPT 3/1	EPT 3/2	EPT 4/1	EPT 4/2	EPT 5/1	EPT 5/2	EPT 5/3
Neale R	.29	.29	-.07	-.01	.41	.43	.38	***.49***	***.51***	***.49***	***.54***
Neale A	.36	***.57***	.02	.21	.23	***.57***	***.52***	***.63***	***.58***	***.70***	***.76***
Neale C	.15	.43	.02	.23	.30	***.47***	.30	.39	***.47***	***.52***	***.47***
Comp 1	.31	.45	.02	.16	***.50***	.46	.45	***.48***	***.49***	***.48***	***.62***
Comp 2	.46	***.57***	.02	.23	***.62***	***.59***	***.55***	***.55***	***.67***	***.66***	***.63***
TRT	.14	.24	-.22	-.08	***.55***	***.65***	***.67***	***.69***	.36	***.48***	***.68***
FWT	.10	.21	.19	.17	.25	.31	.25	.29	.37	.45	.33

Correlations were also completed between the EPT (S1 - S5) and the two comprehension tasks the children did in 1995 in mid-primary school (see Table 5.15). Correlation co-efficients show a substantial relationship between logographic and grapho-phonic aspects of reading as determined by the EPT and the children's comprehension skills as determined in both Comprehension One and Comprehension Two (1995).

Comparison between the EPT (S1 & S5) and the 1995 Title Recognition Test (TRT) (see Table 5.15) showed significant correlations with EPT 5/2 and EPT 5/3. Thus there was a significant relationship between reading background as determined by the TRT and the children's ability to use logographic reading skills and to read decontextualised print four years earlier. The important point is, the EPT was establishing itself as a valuable predictive tool for an aspect of reading five years later.

The 1995 Writing Task shows no significant relationships with the EPT at any stage. There were also few significant relationships between the EPT and the 1990/1 Writing Task (see Table 5.14). This leads to the conclusion that the writing tasks involved skills which were not connected to the EPT either in its logographic phase or its decontextualised reading phase.

Environmental Print Task: Conclusions

As can be seen from the item difficulty rankings in Table 5.7 and in the Item Map for this task (see Figure 5.3), the items in Phase Three of the EPT were the most difficult group of items for the children to achieve over the eighteen month period. In addition, particular items such as Mars Bars, cans of Quik and Colgate toothpaste were obviously unfamiliar to many children even in the earlier phases of the task. The processes involved in reading logos in Phase One and logos out of context in Phase Two clearly had little connection with grapho-phonic knowledge and probably had more to do with the pictorial aspects of the logos such as colour, shape and illustration, although such a contention would need further investigation. This supports the research findings of environmental print tasks discussed in Chapter 3. By the end of their Kindergarten year at school as a group, despite changes in print knowledge over the eighteen month period of data gathering, the group performed poorly in identifying the single words in Phase Three of the task either automatically or through decoding.

Whilst the children as a group were not reading decontextualised print with appreciable accuracy, Rasch Analysis and correlation matrices which show relationships between the EPT and a number of other crucial literacy tasks indicated that literacy learning had taken place, especially during the children's Kindergarten year when literacy instruction of a formal nature had been instituted.

Relationships were also established between logographic reading and picture sequencing before the development of conventional literacy skills. During the kindergarten year the ability to retell a story was related to logographic reading. Thus both oral and visual/pictorial skills were established as being related to logographic reading.

Phase Three of the EPT involves skills in reading decontextualised print. Thus automatic word recognition skills (out of context) as well as letter identification and other grapho-phonic skills such as decoding, recognition of syllables and other combinations of letters are involved. It appears that the level of ability in these skills (tested in the EPT 5/3 in particular) are able to predict results in more global reading measures for this group four years later in 1995.

Research Question 1.2

What kind of knowledge do the children have about environmental print?

1.2.1 Is their print knowledge chiefly related to logographic reading knowledge?

The discussion above shows clearly that, at the end of the eighteen month testing period when the children were concluding their Kindergarten year at school, as a group, their environmental print knowledge was still logographic in nature.

1.2.2 Are the children able to identify words in print automatically in the manner of conventional reading?

The discussion above concludes that, as a group, the children were unable to identify words in print automatically.

1.2.3 Is their ability to read print chiefly related to the use of a combination of logographic and grapho-phonic cues?

The evidence shows that by the end of their Kindergarten year, this group of children performed so that Phase Two of the task achieved virtually the same results as Phase One. It is speculated, therefore, that Phase Two of the EPT was testing the same kind of knowledge as Phase One (logographic reading).

1.2.4 Are there changes over time?

The evidence shows that changes occurred over time in all three phases of the task and that these changes correlated significantly. The most dramatic improvement to be seen is clearly in Phase Three where it is evident that conventional print knowledge increased considerably although from a very low base score.

2. Is the literacy knowledge the children possessed in pre-school and early primary school related to the literacy knowledge they possess in middle primary school?

2.2 Is the literacy knowledge this group of children displayed in pre-school consistent with their literacy development in middle primary school?

The rate of reading, accuracy, and comprehension levels achieved by the children in Neale Analysis of Reading Ability in 1995 correlated substantially with their ability to read decontextualised print at the end of their Kindergarten year. Thus the EPT 5/3 appears to be a good predictor of reading competence in middle primary school.

Both 1995 comprehension tasks correlate substantially with performance in both logographic and grapho-phonic aspects of the Environmental Print Task. Thus the

ability to read decontextualised print at the end of the children's Kindergarten year related significantly to their comprehension scores in middle primary school. Children who were better at EPT 5/3 (reading decontextualised print) remain near the top in reading skills four years later. Conversely, the children who performed poorly ranked low in reading skills in 1995. This leads to the conclusion that much of the groundwork for relative reading skill is laid as early as Kindergarten year.

The children's reading background, as determined in the Title Recognition Test in 1995, was predicted by their ability to read decontextualised print at the end of their kindergarten year four years earlier.

Writing competence does not appear to be connected with either logographic reading or reading decontextualised print in any consistent or significant way.

Letter/Sound Identification Task

Recap of the Nature of the Task

Children were presented with conventional print representations of all fifty-two upper and lower case letters plus alternative representations of two letters "g" and "a" and asked to identify them as letter names or letter sounds or as words beginning with those names or sounds (see Appendix 4.4 and Appendix 4.5).

The Letter/Sound Identification Task partially addressed research question 1.3:

What grapho-phonic knowledge is evident?

1.3.1 Can the children identify letters and/or sounds?

1.3.3 Are there changes over time?

Coding

Responses in this task were coded in a simple format: 1 = incorrect; 2 = correct. As in Marie Clay's (1978) research, correct responses were recorded if the child identified the correct letter name, identified the correct letter sound or named a word beginning with the correct letter.

Item numbers are listed below for easy interpretation of StarMaps and Item Maps.

Item1(55)=A*;	Item2(56)=a;	Item3(57)=B*;	Item4(58)=b*;
Item5(59)=C;	Item6(60)=c;	Item7(61)=D;	Item8(62)=d;

Item9(63)=E;	Item10(64)=e;	Item11(65)=F;	Item12(66)=f*;
Item13(67=G;	Item14(68)=g;	Item15(69)=H* ;	Item16(70)=h*;
Item17(71)=I*;	Item18(72)=i;	Item19(73)=J*;	Item20(74)= j*;
Item21(75)=K*;	Item22(76)=k*;	Item23(77)=L;	Item24(78)=l*;
Item25(79)=M*;	Item26(80) = m*;	Item27(81) = N;	Item28(82) = n;
Item29(83) = O;	Item30(84) = 0;	Item31(85) = P;	Item32(86) = p*;
Item33(87) = Q;	Item 34(88) = q;	Item35(89) = R*;	Item36(90) = r*;
Item37(91) = S;	Item38(92) = s;	Item39(93) = T*;	Item40(95) = t*;
Item41(96) = U*;	Item42(97) = u*;	Item43(98) = V*;	Item44(99)=v*;
Item45(100) = W*;	Item46(101) = w;	Item47(102) = X;	Item48(103) = x*;
Item49(104) = Y*;	Item50(105) = y*;	Item51(106) = Z*;	Item52(107) = z*;
Item53(108) = g;	Item54(109) = a.		

NB Items 1 - 54 = Session One; Items 55 - 108 = Session 5

* = Items falling within latent trait parameters. Noted here for easy reference to StarMap and Item Map

Analysis

Each child's performance was examined in terms of the frequency of correct responses (See Table 5.16). It was observed that eighteen children of the twenty-seven who completed this task in S1 had zero scores. This phenomenon was bound to alter the results of statistical deliberations considerably (see earlier discussion) since so many cases had to be eliminated because of zero scores. Clearly, in the middle of their pre-school year, a low proportion of children (one third) exhibited no letter/sound awareness of any kind in this task. Of these nine children, only one child scored more than two out of fifty-four (Carl: 29/54). The picture was different, however, in S5 at the end of their Kindergarten year eighteen months later (see Table 5.16). The tables show the figures for all cases including the five children for whom only data for S1 exist in order to show more clearly the extent of zero scores. In S1 children scored on only 32 items of the 54, in S5 scores on all 54 items were recorded (see MAXSCR on both tables). Ability estimates are also considerably different especially given the scoring on all items in S5 (see ESTIMATE in both tables in Table 5.16).

Mean Scores

Of a total possible score of 1188 (22 X 54) children scored 39 in S1 demonstrating minimal letter/sound knowledge as a group. Since 29 of those points were scored by one child (Carl), it is probably more informative to look at the mean scores for this task (see Table 5.17). The first three sessions show only small advancements in letter knowledge. The last two sessions, however, show a considerable leap in letter knowledge

concomitant with 6 - 10 months of formal literacy instruction in the children's Kindergarten year.

Rasch Analysis

The summary of fit statistics (Appendix 5.7) for this task shows an infit mean square of 0.98 and a reliability estimate of 0.83 indicating few reversals in the data.

Examination of the StarMap of Item Fit (Figure 5.4) for the Letter/Sound Identification Task shows that 29 items clustered between the latent trait parameters. These items have been starred in the list above for easy referral. The other items lying outside the dotted lines are considered to be answers not bearing a relationship to the latent trait or bearing

Table 5.16

Letter/Sound Identification Task: Comparison of Session 1 and Session 5

Session 1

Case Estimates In input Order
all on all (N = 27 L = 54 Probability Level= .50)

NAME	SCORE	MAXSCR	ESTIMATE	ERROR	INFIT MNSQ
1 All	2	32	-3.29	.77	1.03
2 Am1	2	32	-3.29	.77	1.02
3 Ca1	29	32	2.58	.61	.99
4 Cl1	0	32	Case has zero score		
5 Da1	0	32	Case has zero score		
6 De1	0	32	Case has zero score		
7 Ga1	0	32	Case has zero score		
8 Gr1	1	32	-4.08	1.05	.84
9 Ge1	0	32	Case has zero score		
10 Ja1	0	32	Case has zero score		
11 Jo1	0	32	Case has zero score		
12 Ka1	0	32	Case has zero score		
13 Kg1	0	32	Case has zero score		
14 Ki1	1	32	-4.08	1.05	1.03
15 Ko1	0	32	Case has zero score		
16 Li1	0	32	Case has zero score		
17 Lu1	0	32	Case has zero score		
18 Ma1	0	32	Case has zero score		
19 Na1	2	32	-3.29	.77	.85
20 Ni1	0	32	Case has zero score		
21 Pa1	0	32	Case has zero score		
22 Sa1	2	32	-3.29	.77	.85
23 Sh1	0	32	Case has zero score		
24 St1	0	32	Case has zero score		
25 Ta1	1	32	-4.08	1.05	1.18
26 To1	0	32	Case has zero score		
27 Wa1	2	32	-3.29	.77	1.19
Mean			-2.90		1.00
SD			2.09		.13

Session 5

Case Estimates In input Order

all on all (N = 22 L = 54 Probability Level= .50)

NAME	SCORE	MAXSCR	ESTIMATE	ERROR	INFIT MNSQ
1 Al5	49	54	3.17	.55	.72
2 Am5	5	54	-3.20	.52	1.27
3 Ca5	53	54	5.64	1.23	.28
4 Cl5	36	54	.98	.34	1.25
5 Da5	17	54	-1.16	.35	.96
6 De5	23	54	-.46	.33	.80
7 Ga5	51	54	3.93	.71	1.09
8 Gr5	4	54	-3.49	.57	1.43
9 Ge5	47	54	2.65	.47	1.20
10 Ja5	25	54	-.24	.33	1.15
11 Ka5	52	54	4.56	.88	.86
12 Kg5	52	54	4.56	.88	.84
13 Ki5	21	54	-.69	.34	.83
14 Li5	28	54	.08	.33	.87
15 Lu5	4	54	-3.49	.57	1.10
16 Ma5	20	54	-.80	.34	.88
17 Pa5	7	54	-2.72	.46	.68
18 Sa5	26	54	-.13	.33	.76
19 St5	6	54	-2.94	.49	.77
20 Ta5	12	54	-1.84	.39	1.09
21 To5	34	54	.75	.34	1.03
22 Wa5	5	54	-3.20	.52	1.49
Mean			.09		.97
SD			2.88		.27

Table 5.17

Letter Identification Task: Mean Scores

No of Items = 54

Session	Mean Scores
1	1.77
2	2.59
3	3.09
4	15.81
5	25.22

a relationship to some other construct. Because so many answers to items appeared to be random, it was considered desirable to perform Rasch Analysis only on the items which fell within latent trait parameters - those items between the dotted lines on the StarMap (see Figure 5.5) - to check that these items really were reflecting an underlying attribute.

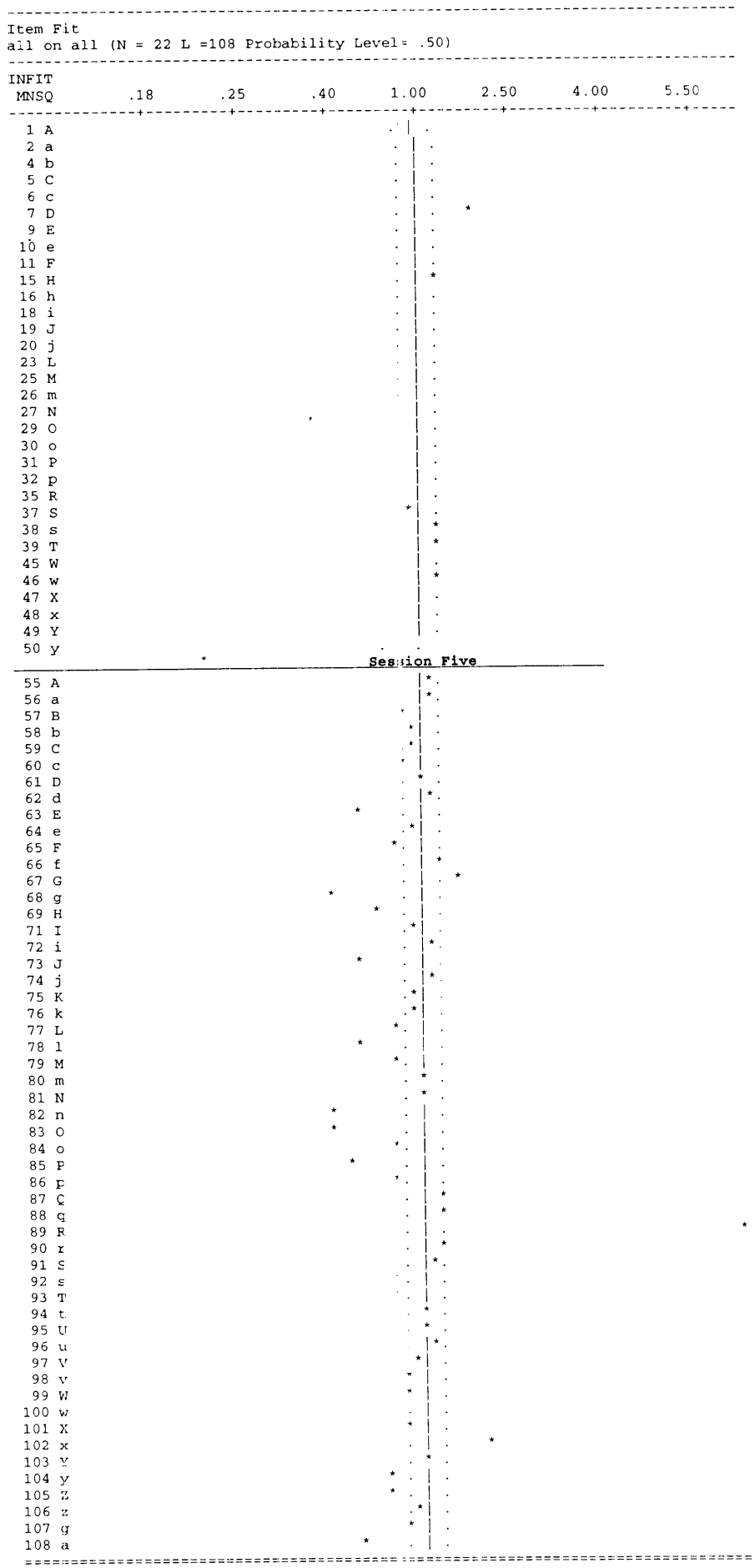

Figure 5. 4
Letter/Sound Identification Task: StarMap of Item Fit

```
-----------------------------------------------------------------------------------
Item Fit
all on subscale (N = 49 L = 29)

-----------------------------------------------------------------------------------
INFIT
 MNSQ        .63       .71       .83      1.00      1.20      1.40      1.60
--------------+---------+---------+---------+---------+---------+---------+-------
  1 A                        .              |        *      .
  3 B                       .*              |               .
  4 b                        .              |        *      .
 12 f                        .              |          *    .
 15 H                        .              |     *         .
 16 h                        .              |             * .
 17 I                        .              |         *     .
 19 J                        .              |               *
 20 j                        .              |          *    .
 21 K                      *.               |               .
 22 k                 *      .              |               .
 24 l                *       .              |               .
 25 M                       . *             |               .
 26 m                        .   *          |               .
 32 p                        .              |        *      .
 35 R                        .              | *             .
 36 r                        .              *               .
 39 T                        .              |            *  .
 40 t                        .              |      *        .
 41 U                        .              |               .       *
 42 u                        .              |    *          .
 43 V                        .   *          |               .
 44 v                        .   *          |               .
 45 W                        .            * |               .
 48 x                        .            * |               .
 49 Y                        .   *          |               .
 50 y                        .   *          |               .
 51 Z                *       .              |               .
 52 z                 *      .              |               .
=================================================================================
```

Figure 5.5

Letter/Sound Identification Task StarMap of Item Fit to a Latent Trait on the Subscale of Items

The latent trait appears to hold up quite well on the items used (the subscale). There are problems with another five Items: 22 (k), 24 (l), 41 (U), 51 (Z) and 52 (z) and these items have been eliminated from further examination of the data demonstrating an underlying attribute.

The summary of case estimates for the procedures on the twenty-nine items indicates an infit mean square of 1, and the summary of item estimates indicates an infit mean square of .99 (see Appendix 5.8). These figures show clearly that these items were valid, also suggesting that further instrument refinement may be possible.

Correlations using Rasch Estimates indicate a correlation co-efficient of .99, a high correlation indicating a strong relationship (see Table 5.18) between the infit items (shown as subscale) and the whole.

```
                    S5 items have been printed in bold type
-----------------------------------------------------------------------------
Item Estimates (Thresholds)
all on all (N = 22 L =108 Probability Level= .50)
-----------------------------------------------------------------------------
  5.0                        X   |
                                 |
                                 |
                                 |
  5.0                            |
                                 |
                                 |
                                 |       2      4      5      6      9
  4.0                            |
                                 |
                                 |
                                 |
  3.0                            |
                                 |
                                 |
  2.0                            |       1     15     37     38     39
                                 |
                                 |
                                 |       7
  1.0                            |
                          XXXX   |
                                 |
   .0                            |      68     97
                             X   |
                                 |      71     88     96
                                 |
 -1.0                            |      69     82     83    104    105
                                 |
                            XX   |      62     98     99    100
                                 |      58     63     64    101    102
                                 |
 -2.0                       XX   |      57     61     65     66     73
                                 |
                             X   |      67     79     86     90     91
                            XX   |
 -3.0                        X   |
                                 |      56     72     80     81     87
                             X   |      55     76     77     95    108
                                 |
                             X   |      35
 -4.0                            |
                                 |      59     84
                                 |
                                 |     107
 -5.0                       XXX  |      50     92     93    106
                             X   |
                             X   |
                             X   |
                                 |
 -5.0                            |
-----------------------------------------------------------------------------
  Each X represents    1 students
```

Figure 5.6

Item (and Case) Map for Letter/Sound Identification Task:

Map of Item Difficulty over Time

Table 5.18
Inter-correlation Matrices: Letter Identification Task Subscale

all on all (N = 49 L = 54)

Correlations using Raw Scores

	subscale	all
Subscale		.99
all	49	

Correlations using Rasch Estimates

	subscale	all
subscale		.99
all	25	

Rasch Parameter Estimates on the subscale (see Table 5.1) show the infit mean squares for each item on the subscale, the difficulty delta, and the item rankings. Table 5.19 shows, in rank order from the easiest to the most difficult, the twenty-four items which show evidence of latent trait development. Interestingly, examination of these items reveals the fact that they all occur with some frequency in children's first names (which cannot be revealed because of the restrictions of anonymity) except for Item 48 (x). Thus, this group of children's early knowledge of print (undoubtedly along with many others) may be related to the ability to recognise their own names in writing.

In a recent study, Treiman et al. (1997) found that children learned consonant letters in the following order: ones with the sound at the beginning of the letter name (eg. b, d, j, k, v, t); ones with the sound at the end of the name (eg. f, l, m, n); ones without the letter sound in the letter name at all (eg. h, w, y). Table 5.19 only partially reflects their findings and may more clearly demonstrate the speculations in the discussion above.

The Item Map using all the items rather than just those on the subscale (Figure 5.6) shows clearly that the group found S1 items (Items 1 - 54) much more difficult than those same items in S5 (Items 55 - 108) since they cluster on the top of the Item Map. Many fewer items from S1 actually appear on the Item Map because of the high rate of zero scores in that session. Because Letter Identification is important in terms of children's developing reading ability (see discussions in Chapter 3), this group of

children's low level of ability to recognise graphically represented letters or sounds has clear implications for literacy assessment both at the end of their Kindergarten year and later, in 1995.

Comparisons with Clay's Research on the same Task

The raw score data were used to compare results with Marie Clay's New Zealand and U.S. research on the same task in 1968 and 1978 (see Appendix 5.9). Of the 22 children who completed the Letter/Sound Identification Task at the end of their Kindergarten year, 18 had raw scores which placed them at the fifth stanine[1] or below (see Table 5.20). Sixteen had raw scores which placed them at the third stanine or below in their age group. The number of children in each stanine group (allocated by age) appears according to task scores (as per Clay) in data gathering S5. Thus most children in the group performed at a level well below that of groups in the U.S. and New Zealand.

Table 5.19

Letter/Sound Identification: Letter Difficulty Rankings

NB: 1 = easiest

Letter/Sound	Ranking
A	1
T	2
t	3
K	3
M	3
m	3
p	3
I	8
R	9
J	10
j	10
x	10
r	13
B	14
b	14
f	14
H	17
W	17
Y	19
y	19
V	19
v	19
h	23
u	24

---

1 Stanines distribute scores according to the normal curve in nine groups from 1, a low score to 9, a high score.

Table 5.20
Letter/Sound Identification Task: Comparisons with Clay's Studies

N = 22

Stanine group	1	2	3	4	5	6	7	8	9
No of chn	7	7	2	2	3	1	-	-	-

Correlations with 1990/91 Tasks
Discussion of correlations between the Letter Identification Task and the Environmental Print Task occur in the previous section (EPT correlations discussion).

The letter Identification Task performance in all five 1990/1 data gathering sessions (S1 - S5) was correlated with a range of other literacy tasks undertaken by the children in 1990/1 (EPT 1 - 5, Reading Task 1 - 5, Sand/Concepts about Print Test 1 - 5). It was also correlated with results of the tasks completed in 1995 (the Neale Analysis of Reading Ability, Comprehensions One and Two, and the Title Recognition Test) when the children were in middle primary school. Table 5.21 presents a correlation matrix detailing the relationships between the various 1990/1 Letter Identification Task data gathering sessions.

Correlations between Letter Identification (Letter ID) S1, S2 and S3 were very high, indicating a very strong relationship. Rasch Analysis (see earlier discussion) shows that when the children were in pre-school and had had no formal literacy instruction their Letter ID knowledge was minimal. Later (S4 & S5), after 6 - 10 months of literacy instruction in primary school expectations were that relationships between S1, S4 and S5 would be progressively weaker. This is certainly borne out by correlation co-efficients (S4: .51, S5: .32).

A similar situation may be observed concerning the correlations between Letter ID S2 and S3, S4 and S5 and between Letter ID S3 and S4 and S5 (see Table 5.21). Thus whilst the early Letter ID data gathering sessions when the children had had no formal literacy instruction correlated highly amongst themselves, they did not correlate highly with the later sessions (S4 & S5) when children's literacy knowledge had clearly changed. As may be expected S4 and S5 correlated highly indicating a very strong relationship.

These relationships show a clear difference between the earlier data gathering sessions (S1, S2, S3) when the children have had no literacy instruction and the later ones (S4

and S5) after 6 - 10 months of instruction. Formal literacy instruction was making a difference.

All five data gathering sessions of the Letter ID Task showed negligible relationships with the early Reading Task sessions (S1, S2, S3). Since the children had few actual reading skills in these first three sessions this finding was expected. However, the later sessions (S4 & S5) of the Reading Task clearly relate significantly to most of the Letter ID sessions (see Table 5.22). Thus with formal literacy instruction in the Kindergarten year grapho-phonic skills and reading skills begin to interact significantly with one another.

Table 5.21
Correlation Matrix: Letter Identification, Sessions 1 - 5

Session/Task	Let ID 1	Let ID 2	Let ID 3	Let ID 4	Let ID 5
Let ID 1	1				
Let ID 2	*.97*	1			
Let ID 3	*.96*	*.98*	1		
Let ID 4	*.51*	*.54*	*.63*	1	
Let ID 5	.32	.40	*.47*	*.92*	1

Significant relationships occur frequently between the Letter ID Task and the Sand/Concepts about Print /Concepts about Print Test in the various sessions (see Table 5.23). The Sand/Concepts about Print/Concepts about Print Test S1 showed a correlation with Letter ID S1 and Letter ID S2 indicating a moderate relationship. All other correlations showed stronger relationships than these. In particular, there are high

Table 5.22
Correlation Matrix: Letter Identification Sessions 1 - 5 and the Reading Task, Sessions 1 - 5

Session/Task	Let ID 1	Let ID 2	Let ID 3	Let ID 4	Let ID 5
Read 1	-.11	-.07	-.04	.31	.46
Read 2	-.29	-.33	-.28	.14	.17
Read 3	-.13	-.08	-.01	.28	.29
Read 4	*.64*	*.64*	*.65*	*.47*	.28
Read 5	*.47*	*.59*	*.63*	*.68*	*.71*

correlations between S4 and S5 of both tasks. As may be expected, the children's conceptual knowledge about print in the latter part of their kindergarten year has a marked relationship to their letter identification skills.

The relationships between these two tasks were the closest and most consistent of any two tasks. Strongest connections were found between the Sand/Concepts about Print Test S5 and the Letter Identification Task S5 (.86) as might be expected in two tasks involving overlapping and related skills over a period of time.

Except for S2, Letter ID tasks S4 and S5 related significantly to all picture sequencing sessions (see Table 5.24). Thus relationships between the ability to identify letters and/or sounds after 6-10 months of formal literacy instruction and the ability to interpret and sequence a series of pictures are indicated. Alternatively, both could be affected by other common factors (indicated in the other tasks) which points to a possible "general literacy factor" which may involve the interaction of different but related skills.

Table 5.23
Correlation Matrix: Letter Identification Sessions 1 - 5 and Sand/Concepts about Print Test, Sessions 1 - 5

Session/Task	Let ID 1	Let ID 2	Let ID 3	Let ID 4	Let ID 5
Sand 1	.45	.44	*.52*	*.53*	*.49*
Sand 2	*.79*	*.81*	*.85*	*.71*	*.61*
Sand 3	*.57*	*.64*	*.69*	*.55*	*.52*
Sand 4	*.63*	*.66*	*.72*	*.85*	*.80*
Sand 5	*.47*	*.53*	*.60*	*.87*	*.86*

Table 5.24
Correlation Matrix: Letter Identification Task, Sessions 1 - 5 and the Picture Sequencing Task, Sessions 1 - 5

Session/Task	Let ID 1	Let ID 2	Let ID 3	Let ID 4	Let ID 5
PS 1	.45	*.53*	*.50*	*.47*	*.50*
PS 2	.35	.46	.41	.27	.31
PS 3	.21	.32	.33	*.62*	*.67*
PS 4	.27	.30	.31	*.49*	*.58*
PS 5	.27	.30	.34	*.58*	*.69*

All sessions of the Letter ID Task related significantly to S4 of the Retell Task (see Table 5.25). Thus in the middle of their Kindergarten year after children have had 5-6 months of instruction in letter/sound identification, the skills learned relate significantly to their retelling abilities. Letter ID S4 and S5 also relate significantly to the last retelling session i.e. after 6-10 months of instruction in literacy letter/sound identification is significantly related to retelling ability.

Table 5.25

Correlation Matrix: Letter Identification Task, Sessions 1 - 5 and the Retell Task, Sessions 1 - 5

Session/Task	Let ID 1	Let ID 2	Let ID 3	Let ID 4	Let ID 5
Retell 1	.20	.29	.31	.44	***.59***
Retell 2	.34	.39	.35	.05	-.01
Retell 3	.01	-.08	-.01	.19	.27
Retell 4	***.60***	***.58***	***.61***	***.65***	***.65***
Retell 5	.19	.16	.24	***.54***	***.58***

When relationships between the EPT and the Letter ID Task are considered, speculation arises concerning the possible existence of a "general literacy factor". Later discussion supports further such speculation when the Sand/Concepts about Print Test and the Reading Task are considered in terms of their correlations with later tasks and with the level of children's print experience.

Relationships between the Letter ID Task and the 1990/1 Writing Task appear tenuous and no significant relationships appear at all until S3. Letter ID S4 and S5 are significantly related to S4 of the Writing Task but not to S5. Thus relationships between these tasks do not support drawing of conclusions which may shed light on the children's literacy learning.

Correlations with 1995 Tasks

The Letter Identification Task is an important task in terms of its relationships to other more comprehensive literacy tasks. Examination of the correlation matrix for this task (Table 5.27) reveals that S4 and S5, conducted in the second half of the children's Kindergarten year, correlate significantly with the 1995 tasks - the Neale Analysis, Comprehensions One and Two and the Title Recognition Test. In particular, Neale Accuracy and Comprehension scores correlate very highly with grapho-phonic knowledge in the last six months of the children's Kindergarten year at school (1991).

Thus it may be speculated that by the end of Kindergarten year the children's grapho-phonic skills predict literacy information four years later. In fact, further examination of the table (Table 5.27) also shows that as early as the end of the pre-school year (1990) children's performance in the Letter ID Task was substantially related to reading accuracy and comprehension skills as determined by the Neale Analysis of Reading Ability in 1995, five years later. Similarly, the relationship between performance in the Letter ID Task at the end of the pre-school year (1990) and Comprehension Two in 1995 is statistically significant.

Table 5.26

Correlation Matrix: Letter Identification Task Sessions 1 - 5 and the Writing Task Sessions 1 - 5

Session/Task	Let ID 1	Let ID 2	Let ID 3	Let ID 4	Let ID 5
Writing 1	-.06	.01	.02	***.47***	.26
Writing 2	.01	.03	.04	.16	.21
Writing 3	0	-.02	-.01	.21	.21
Writing 4	.33	.37	.40	***.57***	***.53***
Writing 5	.03	.08	.09	.35	.41

Letter ID S4 and S5, when the children have had formal literacy instruction for 6 - 10 months, shows a moderate correlation with the Title Recognition Test (TRT) in 1995. Thus children's performance in the Letter identification tasks at the end of their Kindergarten year predicts print exposure four years later. Correlations between the TRT and the early Letter ID sessions (S1, S2 & S3) indicate weaker relationships, probably because the children's letter identification skills were almost non-existent (see Rasch Analysis and Table 5.31).

Similarly Letter ID S4 and S5 show a moderate to strong correlation with the 1995 writing task. Thus children's performance in the Letter identification tasks at the end of their Kindergarten year predicts writing performance four years later. Correlations between the Writing Task (1995) and the early Letter ID sessions (S1, S2 & S3) indicate weaker relationships, probably because the children's letter identification skills were almost non-existent (see Rasch Analysis and Table 5.31).

Comparison of Tables 5.16 and 5.58 also shows that most children who did well in S1 and S5 of the Letter Identification Task were also the better readers in 1995. Most children who did poorly on the Letter Identification Task in S5 were also poor readers in

1995 (compare Table 5.16 and 5.58) Thus grapho-phonic knowledge appears to be able to predict the reading abilities of these children in later primary school. This finding is supported by discussion in Chapter 3. Thus this group of children, although culturally different, shows similar literacy development characteristics to other culturally diverse groups such as those in Clay's studies. In addition, a high degree of stability is indicated across the four years previously discussed.

Table 5.27
Correlation Matrix: Letter Identification and the Neale Analysis of Reading Ability, Comprehensions One and Two, the Title Recognition Test and the Free-Writing Task

Session/Task	Let ID 1	Let ID 2	Let ID 3	Let ID 4	Let ID 5
Neale R	.25	.33	.34	***.60***	***.71***
Neale A	.36	***.48***	***.51***	***.83***	***.87***
Neale C	.41	***.51***	***.54***	***.71***	***.77***
Comp 1	.26	.42	.43	***.59***	***.68***
Comp 2	.43	***.55***	***.59***	***.80***	***.85***
TRT	.34	.45	.46	***.59***	***.65***
FWT	.33	.35	.43	***.66***	***.71***

Letter/Sound Identification Task: Conclusions

In the middle of their pre-school year, 18 children of the 27 tested had zero scores and 8 of the 9 who did score scored no more than 2 out of 24. A mean score of 1.77 for the group's performance thus indicated minimal letter/sound knowledge at this stage.

Of the 54 items in this task, 24 items showed indications of a latent trait when analysis of the data for the last data gathering session was included. Thus, whilst this group of children, at the end of their Kindergarten year, did not have a comprehensive knowledge of letters and sounds, their letter/sound knowledge had developed considerably in the eighteen month period since they were first tested. Significant correlations show that most changes occurred after the children began their Kindergarten year.

Letter identification skills, the ability to read decontextualised print and reading skills begin to interact significantly with one another during the later part of the Kindergarten year when children have had 6 - 10 months of formal literacy instruction. Letter identification skills interact significantly with conceptual knowledge about print as early as the second data gathering session. Strong relationships occur between the

Sand/Concepts about Print Test and the Letter ID Task in the last half of the children's Kindergarten year.

The Letter ID Task's relationship to the more comprehensive literacy tasks of 1995 is an important one. As early as the end of pre-school year (end 1990: S2) there are significant relationships to reading accuracy and comprehension in 1995. The predictability of this simple grapho-phonic test thus has important implications for literacy education for such children. In addition, in the last half of the Kindergarten year, when the children have had some literacy instruction, their reading experience, as measured by the Title Recognition Test, relates significantly to their letter identification skills four years earlier.

Comparisons with Clay's research (see Appendix 5.9) demonstrate letter/sound knowledge levels well below New Zealand and American children of the same age.

Specific response to Research Question 1.3
What kind of grapho-phonic knowledge is evident?

1.3.1 Can the children identify letters and/or sounds?
1.3.5 Are there changes over time?

At the beginning of the data gathering period the answer to this question is certainly in the negative for the group as a whole. During their Kindergarten year this group of children may be said to have developed considerably more significant knowledge about grapho-phonics.The evidence does show however, that this knowledge is limited in comparison with peers in New Zealand and America.

The evidence also shows that most children who had grapho-phonic knowledge superior to their peers at the end of their Kindergarten year, also were better readers four years later in 1995. Conversely, most children whose grapho-phonic knowledge was minimal at the end of their Kindergarten year were poor readers in 1995. This is not so for some children, as will be discussed in the next chapter.

The Reading Task

Recap of the Nature of the Task
Children were asked to read a book which had been read to them a number of times previously (see Appendix 4.18). Their reading behaviour was then observed and its characteristics recorded (see Appendix 5.10). It should be noted here that some items,

such as Items 11, 15 and 19, may be considered controversial or difficult to ascertain in terms of positive responses. Items were based on the work of Rees and Shortland-Jones (1994) and Clay (1979c; 1991a) and positive responses were not recorded unless they were clearly indicated. Other, more equivocal or less clear responses, may have also been positive but were rejected on the basis of uncertainty. It is recognised that this may have affected results in a small way (since uncertain responses were minimal). It was, however, considered important to record unequivocal responses in order to document as large a range of responses to reading as possible for the group analysis.

1. The Reading Task addressed the following research questions:

1.1 Are children aware of the purposes of reading and writing?
- 1.1.1 Do the children know that print carries meaning?
- 1.1.2 What changes occur over time?

1.3 What level of grapho-phonic knowledge is evident?
- 1.3.3 Can they use initial sounds/letters to predict words in context?
- 1.3.4 What evidence is there of ability to identify words automatically?
- 1.3.5 What changes occur over time?

1.4 What do the children know about print conventions?
- 1.4.1 What are their book handling skills?
- 1.4.2 What is their knowledge of directionality?
- 1.4.3 What kind of knowledge do they have about words?
- 1.4.4 What knowledge of punctuation conventions do they have?
- 1.4.5 What changes occur over time?

1.5 What story knowledge do the children have?
- 1.5.2 Do the children use literary/book language?
- 1.5.4 Do the children know that meaning can come from pictures?
- 1.6 What reading knowledge do the children have?
- 1.5.1 Do the children model reading?
- 1.5.2 Do the children bring personal experience to bear on the reading task?
- 1.5.3 Do the children use context to make meaning?
- 1.5.4 Do children use syntax to make meaning?
- 1.5.5 Is children's reading fluent?
- 1.5.6 Do children use self-correction?
- 1.5.7 What changes occur over time?

2. Is the literacy knowledge they possessed in pre-school and early primary school related to the literacy knowledge they possess in middle primary school?

   2.2 Is the literacy knowledge this group of children displayed in pre-school consistent with their literacy development in middle primary school?

Coding

Responses for all twenty-eight items were coded as indicated in a simple format: 0 = no evidence of indicator; 1 = evidence of indicator. The data were coded in fifty-six columns: S1 data, Items 1 - 28; S5 data. Items 29 - 55. The data are based on the twenty-two children who completed this task in both Sessions One and Five. The items for analysis are as follows (the figures in brackets are the S5 item numbers) to facilitate easy interpretation of StarMaps and Item Maps.

1 (29). Turns the book the right way up with the front facing.
2 (30). Turns the pages appropriately.
3 (31). Uses pictures to infer meaning on a printed page.
4 (32). Realises that print carries a message
5 (33). Links reading to personal experience.
6 (34). Tells the story from memory whilst turning pages.
7 (35). Knows that writing and pictures are different.
8 (36). Recognises own name or part of it in print.
9 (37). Is beginning to recognise some letters of the alphabet.
10 (38). Points to text while reading.
11 (39). Expresses enjoyment by joining in orally and responding emotively when reading familiar stories.
12 (40). Knows that print goes from left to right.
13 (41). Repeats parts of the text from memory.
14 (42). Is beginning to show awareness of literary language eg once upon a time.
15 (43). Uses prior knowledge of context and personal experience to make meaning.
16 (44). Asks for assistance.
17 (45). Shows some knowledge of letter-sound relationships.
18 (46). Points to specific known words as they are read.
19 (47). Uses initial letter sounds to predict words in text.
20 (48). May read word-by-word when reading an unfamiliar text
21 (49). Reading is fluent.
22 (50). Some loss of meaning through overuse of grapho-phonics.
23 (51). Makes meaningful substitutions.

24 (52). Subvocalises when reading difficult text silently.

25 (53). Is beginning to use self-correction as a strategy.

26 (54). Uses knowledge of sentence structure and punctuation to help make meaning.

27 (55). Has a bank of sight words recognised in many contexts.

28 (56). Relies heavily on grapho-phonics for word identification.

Analysis

Each child's performance in the Reading Task was examined in terms of the reading indicators displayed which were expressions of the research questions. The number of indicators present in each child's performance was recorded (see Appendix 5.10).

Mean Scores for Positively Judged Responses

Of a total possible score of 616 (22 children X 28 items), children scored 125 in S1. In S5 a total of 304 was scored, indicating considerable changes in the group in reading knowledge over the eighteen month period between S1 and S5. Examination of the mean scores for the Reading Task gives a clearer picture of shifts in group performance (see Table 5.28).

Rasch Analysis

The summary of fit statistics (Appendix 5.7) for this task shows an infit mean square of 0.91 and a reliability estimate of 0.96 indicating few reversals in the data. Examination of the item estimates for S1 (See Table 5 29) reveals that 15 out of the 28 items show zero scores. However the estimates for S5 (see Table 5.30) show that no items had zero scores and that five items had perfect scores. Thus clear changes in reading knowledge are documented.

Table 5.28

Reading Task: Mean Scores

No of Items = 28

Session	Mean Scores
1	5.68
2	5.09
3	8.31
4	10.72
5	13.81

Table 5.29
Reading Task: Item Estimates for Session 1

Item Estimates (Difficulty and Taus) In input Order
all on all (N = 22 L = 56 Probability Level= .50)

	ITEM NAME	SCORE	MAXSCR	DIFF	INFT MNSQ	OUTFT MNSQ
1	item 1	17	22	-2.19	1.09	4.26
				.57		
2	item 2	15	22	-1.62	.76	.60
				.52		
3	item 3	20	22	-3.43	.98	.71
				.78		
4	item 4	7	22	.33	1.01	.78
				.53		
5	item 5	3	22	1.70	1.35	1.12
				.69		
6	item 6	16	22	-1.89	1.23	1.09
				.54		
7	item 7	6	22	.62	.99	.74
				.55		
8	item 8	0	0	Item has zero score		
9	item 9	0	0	Item has zero score		
10	item 10	7	19	.05	1.17	1.03
				.54		
11	item 11	9	19	-.37	1.78	2.15
				.53		
12	item 12	6	22	.62	1.32	1.07
				.55		
13	item 13	14	22	-1.37	1.51	2.71
				.50		
14	item 14	0	0	Item has zero score		
15	item 15	0	0	Item has zero score		
16	item 16	2	22	2.24	.74	.31
				.81		
17	item 17	0	0	Item has zero score		
18	item 18	0	0	Item has zero score		
19	item 19	0	0	Item has zero score		
20	item 20	0	0	Item has zero score		
21	item 21	0	0	Item has zero score		
22	item 22	0	0	Item has zero score		
23	item 23	0	0	Item has zero score		
24	item 24	0	0	Item has zero score		
25	item 25	0	0	Item has zero score		
26	item 26	1	22	3.06	1.25	1.66
				1.07		
27	item 27	0	0	Item has zero score		
28	item 28	0	0	Item has zero score		

Table 5.30
Reading Task: Item Estimates for Session 5

Item Estimates (Difficulty and Taus) In input Order
all on all (N = 22 L = 56 Probability Level= .50)

	ITEM NAME	SCORE	MAXSCR	DIFF	INFT MNSQ	OUTFT MNSQ
29	item 29	0	0	Item has perfect score		
30	item 30	0	0	Item has perfect score		
31	item 31	0	0	Item has perfect score		
32	item 32	21	22	-4.21 (1.05)	.93	.34
33	item 33	6	22	.62 (.55)	1.25	1.10
34	item 34	20	22	-3.43 (.78)	1.06	5.91
35	item 35	20	22	-3.43 (.78)	1.14	5.92
36	item 36	2	22	2.24 (.81)	1.14	1.06
37	item 37	7	22	.33 (.53)	1.00	.88
38	item 38	20	22	-3.43 (.78)	.90	.40
39	item 39	4	22	-1.37 (.50)	1.02	1.36
40	item 40	7	22	-2.19 (.57)	.81	.67
41	item 41	0	0	Item has perfect score		
42	item 42	0	0	Item has perfect score		
43	item 43	8	22	.07 (.51)	1.02	1.23
44	item 44	13	22	-1.12 (.50)	.95	.81
45	item 45	6	22	.62 (.55)	.92	.87
46	item 46	6	22	.62 (.55)	.65	.54
47	item 47	5	22	.93 (.58)	.53	.37
48	item 48	4	22	1.28 (.63)	.47	.27
49	item 49	4	22	1.28 (.63)	.72	.44
50	item 50	1	22	3.06 (1.07)	.99	.33
51	item 51	1	22	3.06 (1.07)	.95	.29
52	item 52	2	22	2.24 (.81)	.65	.25
53	item 53	4	22	1.28 (.63)	.47	.27
54	item 54	5	22	.93 (.58)	.53	.37
55	item 55	6	22	.62 (.55)	.72	.89
56	item 56	2	22	2.24 (.81)	1.23	3.15
Mean				0.00	.98	1.30
SD				2.04	.29	1.53

Examination of the StarMap of Item Fit for the 22 children who completed the Reading Task in both S1 and S5 (see Figure 5.6) shows that in S1 only 13 of the 28 indicators fell within latent trait parameters. The raw data show that the children did not score at all on the missing indicators in S1.

Of the 13 indicators from S1 which do appear on the StarMap, four appear outside latent trait parameters, indicating little relationship to the latent trait demonstrated. Linking reading to personal experience (Item 5), expressing enjoyment and through participation in familiar stories (Item 11), repeating part of the text from memory (Item 13) and asking for assistance (Item 16) drew responses which did not contribute to the latent trait indicated by Rasch Analysis.

Items contributing to an underlying attribute were: showing the correct position of the book for reading (Item 1), being able to turn the pages of a book appropriately (Item 2) and being able to infer meaning from pictures on a printed page (Item 3). These three items showed perfect scores in S5 (Items 29 - 31). This is clearly corroborated in the Picture Sequencing Task, Item 2 in that task being one of the items within latent trait parameters. The knowledge that print carries a message (Item 4), pointing to text whilst modelling reading (Item 10) and knowing that there is a difference between print and pictures (Item 7) were also indicated as part of an underlying attribute. Telling the story from memory (Item 6) and repeating parts of the text from memory (Item 13) were also significant as well as using knowledge of sentence structure and syntax to make meaning (Item 26) and asking for assistance (Item 16).

Items 41 - 42 are missing because perfect scores were recorded for these items. Thus all children scored in showing awareness of "book" language and repeating parts of the text being read from memory.

The balance of all the items listed above in S1 as contributing to a latent trait appear once again in S5 except for the Item 54 (Item 26 in S1): uses knowledge of sentence structure and punctuation to make meaning. In S1 the children were attending an all-Aboriginal pre-school, in S5 they were attending mainstream schools. It is interesting to speculate therefore, whether acceptance of Aboriginal English and its syntax had anything to do with this result.

Other items also appear as significant in relation to changes over time in the latent trait and thus provide clear evidence of changes in the reading process. Linking reading to personal experience and context (Items 33, 43 and 47), recognising names, or part of them, in print (Item 36), a level of grapho-phonic knowledge (Items 37 and 45), taking

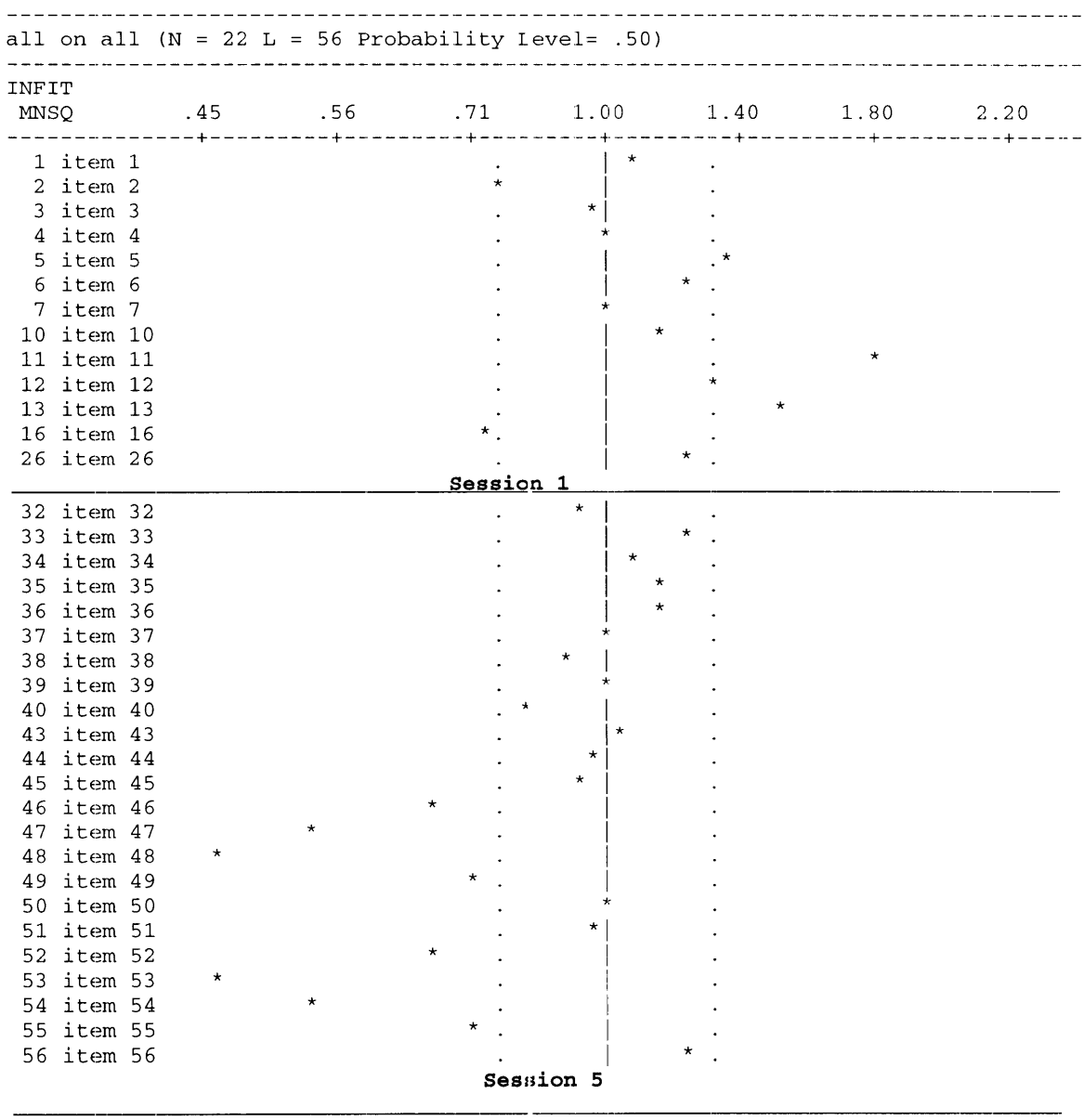

Figure 5.7
Reading Task: StarMap of Item Fit

part in storyreading activities with enjoyment (Item 39) and knowledge of directionality (Item 40) contributed to the latent trait demonstrated in this task. Over-use of graphophonics which interfered with meaning in S5 (Item 50 and 56), and making meaningful substitutions (Item 51) were also part of the latent trait demonstrated.

Whilst the group's emergent reading knowledge clearly changed considerably over the eighteen month period of data gathering in 1990/1, there were other items which were deemed non-contributory in terms of a latent trait by Rasch Analysis. Interestingly, many of these (listed later) may be said to be more closely related to conventional

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-----------------------------------------------------------------------------------
Item Estimates (Thresholds)                NB S5 Items are in bold print
all on all (N = 22 L = 56 Probability Level= .50)
-----------------------------------------------------------------------------------
  4.0                              |
                                   |
                                   |
                                   |
                                   |
  3.0                              |      26     50     51
                                   |
                                   |
                                   |
                                   |      16     36     52     56
  2.0                          X   |
                                   |
                                   |       5
                                   |
                               X   |
                               X   |      48     49     53
  1.0                              |
                               X   |      47     54
                                   |
                                   |       7     12     33     45     46
                                   |       4     37
                               X   |
   .0                              |      10     43
                               X   |
                               X   |
                              XXX  |      11
                               X   |
                                   |
                              XX   |
 -1.0                         XXX  |      44
                               X   |
                                   |      13     39
                                   |       2
                                   |
                               X   |       6
 -2.0                          X   |
                                   |       1     40
                               X   |
                                   |
                              XX   |
                                   |
 -3.0                              |
                                   |
                                   |       3     34     35     38
                                   |
                                   |
                                   |
 -4.0                              |
                                   |      32
                                   |
                                   |
                                   |
 -5.0                              |
-----------------------------------------------------------------------------------
  Each X represents     1 students NB Scme thresholds could not be fitted to the
display
```

Figure 5.8

Reading Task: Map of Item Difficulty

reading, possibly lending credence to those items contributing to the latent trait as being reasonable measures of emergent reading.

Being able to point at words as they were read (Item 46), using initial letter sounds to predict words (Item 47), fluency whilst reading (Item 48), reading word-by-word (Item 49) were items which Rasch Analysis demonstrated were not contributing to the latent trait. In addition, use of subvocalisation (Item 52), self-correction (Item 53), and a bank of sight words recognisable in many contexts (Item 55) were items which clearly appeared outside the latent trait parameters.

Examination of the infit mean squares for each item in Appendix 5.11 reflects the above analysis. Figure 5.8, the map of Item Difficulty records children's ability in this task and the level of difficulty of the items as they appear distributed on a logit scale.

Correlations with 1990/1 Tasks

Correlations between the Reading Task, the Environmental Print Task and the Letter Identification Task have been discussed in earlier sections.

The Reading Task was one which entailed a comprehensive range of reading skills. Rasch Analysis shows (see earlier discussion) that by the end of their Kindergarten year, as a group, the children were effectively unable to read. The correlations indicated in Table 5.31, between the various sessions over the eighteen month period of data gathering indicate no significant relationships between the sessions.

Table 5.31
Correlation Matrix: Reading Task, Sessions 1 - 5

Session/Task	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5
Reading 1	1				
Reading 2	.28	1			
Reading 3	.08	.18	1		
Reading 4	-.01	.15	.26	1	
Reading 5	.36	-.21	.09	.32	1

The fact that no significant relationships exist between the various sessions of the task calls into question the whole notion of treating all the items as if they represented a unitary reading concept. Examination of the raw scores reveals that children who have a high score at one stage do not necessarily have a high score in the next. It may be

spurious to add the scores into a single number when some items are more subjective in nature (e.g. Item 16) than others. Item 10, for example, (points to text whilst reading) may be dropped from a child's reading skills repertoire when no longer needed and yet that would be scored negatively in later sessions. Thus the factors may be more separate than at first thought. This is supported by the Rasch Analysis in which a maximum of 15 (in S5) of the 28 items appear as part of the latent trait which may be assumed to be a group of skills associated with reading conventionally. Thus it may be that unlike items have been added together in an invalid way.

Examination of the correlation co-efficients for the Reading Task and the Sand/Concepts about Print Test show that before the children had received formal literacy instruction (S1, S2, S3) there were no significant relationships between the tasks (see Table 5.32). Thus, relationships between the Reading Task and the Sand/Concepts about Print Test were very weak in S1, S2 and S3. The Reading Task appears to reflect more comprehensive knowledge of reading, involving grapho-phonic knowledge,

Table 5.32
Correlation Matrix: Reading Task, Sessions 1-5 and Sand/Concepts about Print Test, Sessions 1-5

Session/Task	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5
Sand 1	.21	.13	.40	.24	.30
Sand 2	.14	.01	.26	***.54***	***.53***
Sand 3	.17	.01	.44	***.48***	***.63***
Sand 4	.24	.21	.31	***.52***	***.79***
Sand 5	.27	.22	.37	.38	***.82***

semantic interaction skills, and syntactic knowledge. Significant relationships between the Sand/Concepts about Print Test and the Reading Task begin to appear along with formal literacy instruction in primary school during the children's Kindergarten year.

The Reading Task showed strongest relationships with the Sand/Concepts about Print Test in S4 and S5, the highest correlation occurring between S5 in the Sand/Concepts about Print Test and S5 in the Reading Task. Clearly, the items tested in the Reading Task during the children's Kindergarten year were closely related to their knowledge of print concepts. Thus schooling was making a difference in terms of literacy knowledge.

Increasingly strong relationships were observable between S4 and S5 of the Reading Task and S2 - 5 of the Sand/Concepts about Print Test reflecting once again the increasingly specific nature of the literacy knowledge being gained in the children's Kindergarten year. In particular, a strong relationship was observed between the Sand/Concepts about Print Test S5 and the items in the Reading Task S5.

Correlations between the RT and the Picture Sequencing (PS) Task show no significant relationships until S5 of the Reading Task (see Table 5.33). In all but S2, the Reading Task (S5) correlates substantially with the PS Task. Thus the ability to interpret and sequence pictures is significantly related to reading ability as tested by the Reading Task at the end of Kindergarten year after 6-10 months of formal instruction in literacy.

Table 5.33
Correlation Matrix: Reading Task, Sessions 1-5 and Picture Sequencing Task, Sessions 1-5

Session/Task	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5
PS 1	.11	-.35	-.19	.10	***.51***
PS 2	-.11	-.20	-.05	.18	.44
PS 3	.18	.06	0	.12	***.56***
PS 4	.14	.17	-.19	.03	***.49***
PS 5	.42	.36	.43	.14	***.54***

Only one significant relationship between the Reading Task and the Retell Task is recorded (see Table 5.34) and that occurs between Reading S5 and Retell S4. It may be that conditions existing at that particular data gathering (in the middle of the children's Kindergarten year) were somehow different and more conducive to significant relationships between the two tasks.

Examination of the correlation matrix for the Reading Task and the Writing Task (WT) shows significant correlations between the WT S4 and the Reading Task S3, S4 and S5 (see Table 5.35). Thus the writing competencies that the children have in the middle of their Kindergarten year are substantially related to their reading skills throughout their Kindergarten year. The Reading Task in S3 is also substantially related to the WT in S5. Thus reading skills at the beginning of the children's Kindergarten year at school are substantially related to their writing skills at the end of that year. These results are somewhat difficult to interpret. Given the tenuous nature of the rest of the correlation

matrix, few firm conclusions may be drawn about the relationships between these two tasks.

Correlations with 1995 Tasks

All three aspects of the 1995 Neale Analysis of Reading Ability rate, accuracy and comprehension correlated with S5 of the Reading Task (see Table 5.36). Thus developing literacy knowledge in the children's Kindergarten year may be said to predict later reading competence. Similarly, high correlations between the 1995 Comprehension Tasks and Reading S5 occurred (Comprehension One Comprehension Two), further supporting the above contentions. A correlation of .71 between the 1995 Title Recognition Test and S5 of the Reading Task (at the end of the children's Kindergarten year) highlighted the significance of reading background in developing literacy competence.

Table 5.34

Correlation Matrix: Reading Task, Sessions 1-5 and Retell Task, Sessions 1-5

Session/Task	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5
Retell 1	.27	.11	.43	.26	.46
Retell 2	-.41	-.13	.06	.21	-.18
Retell 3	.42	.43	-.04	-.04	.02
Retell 4	.28	.18	-.03	.43	***.48***
Retell 5	.28	.23	-.08	-.04	.28

Table 5.35

Correlation Matrix: Reading Task, Sessions 1 - 5 and Writing Task, Sessions 1 - 5

Session/Task	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5
Writing 1	-.18	.17	.44	.18	-.04
Writing 2	-.25	-.01	.31	.04	-.10
Writing 3	-.34	-.04	.45	-.05	-.12
Writing 4	.01	.23	***.61***	***.49***	***.47***
Writing 5	.11	.36	***.52***	.17	.36

Table 5.36
Correlation Matrix: Reading Task Sessions 1 - 5 and the Neale Analysis of Reading Ability, Comprehensions One and Two, the Title Recognition Test and the Free-Writing Task

Session/Task	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5
Neale R	.34	.04	.12	.12	***.56***
Neale A	.28	.12	.33	.41	***.75***
Neale C	***.48***	-.01	.21	.32	***.65***
Comp 1	.31	.17	.06	.25	***.74***
Comp 2	.36	.04	.06	.32	***.72***
TRT	.25	.09	-.04	.30	***.71***
FWT	***.50***	-.14	.17	.11	***.60***

Significant relationships between the Reading Task and the Writing Task (1995) were recorded in S1 and S5 (see Table 5.36). The relationship between Reading S5 and Writing S5 was substantial indicating a clear connection between reading at the end of the children's Kindergarten year and their writing performance four years later.

Reading Task: Conclusions

Whilst reading knowledge changed and expanded over the eighteen month period between data gathering S1 and S5, the results show clearly that the children as a group were still some considerable way away from conventional reading. The number of items with zero scores and the number of items outside latent trait parameters (indicating random results) meant that only twenty-four items out of the 54 in S1 and S5 bore a significant relationship to an underlying attribute. The conclusion must be made that, with the group under study, early reading knowledge as defined by the literature had not yet developed into conventional reading processes.

Relationships between the early tasks as described by the correlations completed support the notion that developing literacy for these children began to occur (as might be expected) after pre-school and during their Kindergarten year when intensive and specific teaching concerning literacy was conducted. Thus this group of Aboriginal children, whilst not yet readers in the conventional sense, made strides in literacy knowledge during their Kindergarten year as a result of instruction in literacy processes.

Relationships between the 1995 tasks and the Reading Task show that the increased reading knowledge evident in this group of children at the end of their Kindergarten

year was clearly connected to reading competence later in their primary schooling (1995).

Research Questions

1.1 Are children aware of the purposes of reading and writing?

1.1.1 Do the children know that print carries meaning?

1.1.2 What changes occur over time?

By the end of their Kindergarten year the group clearly knew that print carried meaning.

1.3 What level of grapho-phonic knowledge is evident?

1.3.3 Can they use initial sounds/letters to predict words in context?

1.3.4 What evidence is there of ability to identify words automatically?

1.3.5 What changes occur over time?

By the end of their Kindergarten year the group was able to recognise some letters of the alphabet and was beginning to develop knowledge of letter/sound relationships and use initial letter sounds to predict words in text. As a group, the children were unable to identify words automatically by the end of their Kindergarten year.

1.4 What do the children know about print conventions?

1.4.1 What are their book handling skills?

1.4.2 What is their knowledge of directionality?

1.4.3 What kind of knowledge do they have about words?

1.4.4 What knowledge of punctuation conventions do they have?

1.4.5 What changes occur over time?

In the middle of their pre-school year most children were able to hold the book the right way up with the front facing and all were able to turn the pages appropriately. By the end of their Kindergarten year all children were able to do this.

In the middle of their pre-school year a few children had some knowledge of directionality. By the end of their Kindergarten year most had a good knowledge of print conventions involving directionality.

None of the children, in the middle of their pre-school year, could point to specific known words and identify them, they did not read word-by-word since most could not identify words at all, and they could not make meaningful substitutions since they had no bank of sight words familiar to them. By the end of their Kindergarten year, a few

children could point to the occasional words and identify them. Even fewer read haltingly word-by-word. The group could not make meaningful substitutions since the children were not able to read fluently enough for this. The children did not demonstrate any recognition of their own names or parts of their names in print during the whole period of testing.

As a group the children were unable to use their knowledge of sentence structure and punctuation to bring to bear on the reading process in pre-school. By the end of their Kindergarten year a small proportion of the group were able to do this.

1.5 What story knowledge do the children have?
- 1.5.2 Do the children use literary/book language?
- 1.5.4 Do the children know that meaning can come from pictures?

In the middle of their pre-school year no children displayed an awareness of literary language. By the end of their Kindergarten year all children could use some form of 'book' language, repeat parts of the text from memory and point to the text whilst reading. Nearly all of the group could tell a story from memory whilst turning pages.

In pre-school a small proportion of the group showed awareness that print and pictures were different but by the end of Kindergarten nearly all of the group demonstrated they knew this.

1.6 What reading knowledge do the children have?
- 1.5.1 Do the children model reading?
- 1.5.2 Do the children bring personal experience to bear on the reading task?
- 1.5.3 Do the children use context to make meaning?
- 1.5.4 Do children use syntax to make meaning?
- 1.5.5 Is children's reading fluent?
- 1.5.6 Do children use self-correction?
- 1.5.7 What changes occur over time?

In the middle of their pre-school year most of the group could tell the story from memory whilst turning the pages, repeat parts of the text from memory and half the group pointed to the text whilst reading. By the end of their Kindergarten year could repeat parts of story text from memory and point to text whilst reading.

Few children related their reading to personal experience in their pre-school year. About a third of the group could do so by the end of their Kindergarten year. As a group the children were unable to use their knowledge of syntax to bring to the reading process in pre-school. By the end of their Kindergarten year only a small proportion of the group were able to do this.

As a group the children were non-readers in pre-school. Thus there was no chance of demonstrating self-correction strategies in reading. By the end of their Kindergarten year a small proportion demonstrated some fluency in reading.

2. Is the literacy knowledge they possessed in pre-school and early primary school related to the literacy knowledge they possess in middle primary school?

   2.2 Is the literacy knowledge this group of children displayed in pre-school consistent with their literacy development in middle primary school?

Results in the Reading Task were clearly related to the children's literacy competence in later primary school. Correlations showed especially strong relationships between the reading knowledge being developed by the end of the children's Kindergarten year and later knowledge in 1995 as shown by significant correlations with the three aspects of the Neale Analysis, the two comprehension tasks, the Title Recognition Test and the Free-Writing Task. Thus the Reading Task as conducted at the end of the children's Kindergarten year appears to be able to predict aspects of children's literacy performance four years later in middle primary school.

Sand/Concepts about Print Test

Recap of the Nature of the Task

The Sand/Concepts about Print Test examines the knowledge which the child has about print. In the process of having a book read to them, children were asked questions about the positioning of print and pictures on the pages and other print conventions (see Appendix 4.9) and their responses were recorded (see Appendix 5.12).

The Sand/Concepts about Print Test addressed the following research questions:

1.4 What do the children know about print conventions?
   1.4.1 What are their book handling skills?
   1.4.2 What is their knowledge of directionality?
   1.4.3 What kind of knowledge do they have about words?

1.4.4 What knowledge of punctuation conventions do they have?

1.4.5 What changes occur over time?

2. Is the literacy knowledge they possessed in pre-school and early primary school related to the literacy knowledge they possess in middle primary school?

2.2 Is the literacy knowledge this group of children displayed in pre-school consistent with their literacy development in middle primary school?

Coding

Responses for all twenty-four items were coded as indicated in a simple format: 0 = no evidence of indicator; 1 = evidence of indicator. The data were coded in forty-eight columns: S1 data, Items 1 - 24; S5 data, Items 25 - 48. The data are based on the twenty-two children who completed this task in Sessions 1 and 5. Items for analysis are reproduced as follows (the S5 item numbers are in brackets) so that StarMaps and Items maps may be easily interpreted.

1 (25). Front of book

2 (26). Print (not picture)

3 (27). Points top left at '*I took....*'

4 (28). Moves finger left to right on any line.

5 (29). Moves finger from the right-hand end of a higher line to the left-hand end of the next lower line, or moves down the page.

6 (30). Word by word matching.

7 (31). Both concepts must be correct, but may be demonstrated on the whole text or on a line, word or letter.

8 (32). Verbal explanation or pointing to the top of the page.

9 (33). Score for beginning with 'The' and moving right to left across the lower line and then the upper line, OR, turning the book around and moving left to right in the conventional movement pattern.

10 (34). Any explanation which implies that line order has been altered.

11 (35). Says or shows that a left page precedes a right page.

12 (36). Notices at least one change of word order.

13 (37). Notices at least one change in letter order.

14 (38). Notices at least one change in letter order.

15 (39). Says 'Question mark', or 'A question', or 'Asks something'.

16 (40). Says 'Full stop', 'Period', or 'It tells you when you've said enough', or It's the end'.

17 (41). says 'A little full stop' or 'A rest', or 'A comma'.

18 (42). says 'That's someone talking', 'Talking', 'Speech marks', 'Print' (from computers).

19 (43). Locates two capital and lower case pairs.

20 (44). Points correctly to both *was* and *no*.

21 (45). Locates one letter and two letters on request.

22 (46). Locates one word and two words on request.

23 (47). Locates both a first and a last letter.

24 (48). Locates one capital letter.

Analysis

Each child's performance in the Sand/Concepts about Print Test was examined in terms of the indicators observed which were expressions of the research questions listed above. The number of indicators present in each child's performance was recorded (see Appendix 4.9 and Appendix 5.12).

Table 5.37

The Sand/Concepts about Print Test: Mean Scores

No of Items = 24

Session	Mean Score
1	2.95
2	3.40
3	4.63
4	9.22
5	10.20

Mean Scores

Of a total possible score of 528 (22 children X 24 items) children scored 65 in S1. In S5 a total of 226 was scored indicating the group made considerable advancement in knowledge about print and print concepts over the eighteen month period between S1 and S5. A clearer picture of group performance, however, may be had from an examination of mean scores for the Sand/Concepts about Print Test (see Table 5.37).

Rasch Analysis

The summary of fit statistics (Appendix 5.7) for this task shows an infit mean square of 0.94 and a reliability estimate of 0.97 indicating few reversals in the data.

Examination of the StarMap of Item Fit to a Latent Trait for the twenty-two children who completed the Sand/Concepts about Print Test in both Sessions One and Five (see

Figure 5.9) shows that 17 items do not appear at all and another 19 items on the StarMap fall outside the dotted lines. In fact, only ten items of the forty-eight show evidence of relationship to a latent trait. Two perfect scores were recorded for Items 25 and 32 which both fall in S5 (see Appendix 5.13). Thus all children knew where the front of the book was and all of them knew when a picture was presented to them upside down.

Infit mean squares for each item corroborate the above in more detail as presented in Appendix 5.13. The ten items which support the latent trait configuration on the StarMap concern the following concepts: ability to identify the front of the book

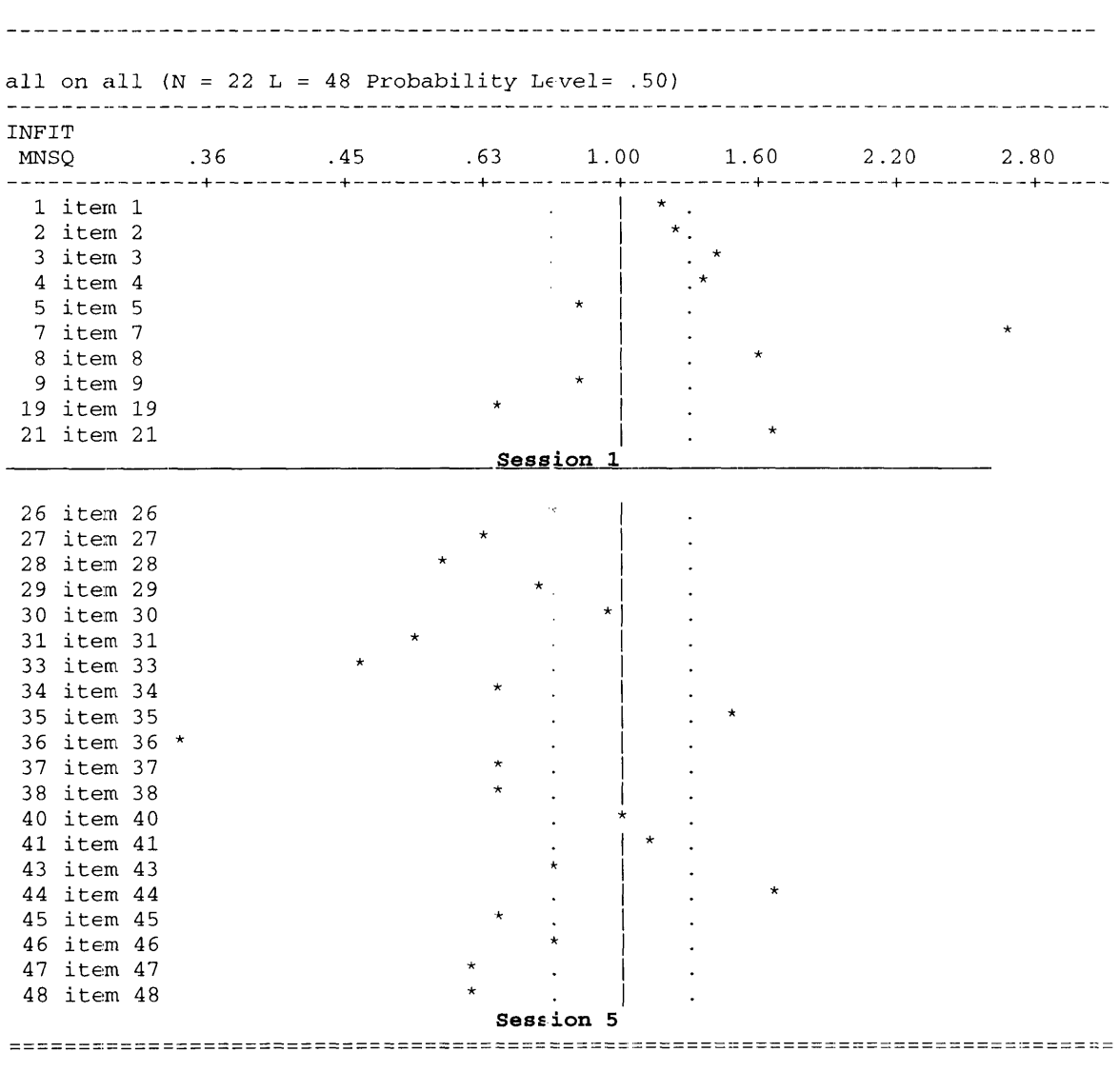

Figure 5.9

Sand/Concepts about Print Test: StarMap of Item Fit

```
-----------------------------------------------------------------------------
Item Estimates (Thresholds)
all on all (N = 22 L = 54 Probability Level= .50)
-----------------------------------------------------------------------------
 4.0                          |
                              |
                              |      5     9    19    34    37
                              |
 3.0                          |
                          X   |
                              |
                          X   |
                              |     36    41
                              |
 2.0                          |
                              |      7    21
                              |
                              |      4
 1.0                          |
                              |
                         XX   |
                              |
                         XX   |     40    48
                              |
  .0                          |     46    47
                         XX   |
                              |
                          X   |      2     3
                              |
-1.0                      X   |     31    45
                          X   |
                              |
                          X   |     30    33
                              |
                          X   |
-2.0                          |
                        XXXX  |
                              |
                          X   |     29    43
                              |      8    28
-3.0                          |
                              |
                          X   |
                              |
                              |      1    27
                              |
-4.0                          |
                          X   |     35
                              |
                              |
-5.0                      XX  |
                              |
                              |
                              |
                              |     26
-5.0                          |
-----------------------------------------------------------------------------
  Each X represents    1 students
  Some thresholds could not be fitted to the display
```

Figure 5.10

Sand/Concepts about Print Test: Item Difficulty over Time

(Item 1), knowledge that the print carries the message not the picture (Item 2), knowing that print proceeds along a line from left to right (Item 5), knowing where the story begins and ends (Item 6), knowing which way up print goes (Item 9), knowing the purposes of full-stops and commas (Items 16 & 17), knowing the difference between lower case and upper case letters (Item 19), knowing the conventional appearance of a word on a page (Item 22).

Clearly, the group's knowledge of print conventions was basic, with the latent trait demonstrating the development of a very early knowledge of basic print concepts over the eighteen month period. The large number of items excluded through zero scores and infit mean squares unrelated to a latent trait indicate that, for the most part, this test was well beyond the capabilities of the group as a whole.

The map of item difficulty for this task (Figure 5.10) may shed further light on children's performance in this test. It records children's ability in this task and the level of difficulty of the items as they appear distributed on a logit scale.

Comparisons with Marie Clay's 1968 and 1978 Research

The Sand/Concepts about Print Test was devised by Marie Clay (1991a) and has been used in many literacy research projects worldwide. Appendix 5.14 shows the results of this research conducted in a number of different countries in terms of normalised scores and stanine groups. This enables the raw scores of the children in this group to be compared with those scores and then placed in stanine groups. Thus in Table 5.38 children have been placed in their stanine groups according to their age and their raw scores.

Table 5.38

Sand/Concepts about Print Test: Comparisons with Clay's Studies

Number of Children in Stanine Groups According to Task Scores

for Data Gathering Session Five

N = 22

Stanine group	1	2	3	4	5	6	7	8	9
No of chn	6	5	1	4	4	1	1	-	-

The tables produced in Appendix 5.20 enable easy comparisons to be made between individual performances and Clay's results. Children's knowledge of print conventions

by the end of their kindergarten year is such that it is clear their experience of books and print materials is small and well below Clay's results.

Correlations with 1990/1 Tasks

Correlations between the Sand/Concepts about Print/Concepts about Print Test, the EPT, the Letter ID Task and the Reading Task have been discussed in earlier sections pertaining to those tasks.

Relationships between all sessions of the Sand/Concepts about Print Test were consistently significant (See Table 5.39). High correlations (more than .7) were recorded between S1 and S2. However, even between S1 and S5 there were moderately significant correlations indicating a substantial relationship.

Correlations between S2 and S3; S2 and S4 ; S2 and S5; S3 and S4 showed a marked relationship. Along with the substantial relationship indicated between S3 and S5 the figures support the notion of strong internal validity. Between S4 and S5, there is a very strong relationship. Thus the developing print knowledge of the children in their Kindergarten year is indicated in the very strong relationship between the last two sessions.

Moderate to high correlations were evident throughout the entire testing period. They point to a high level of stability in terms of the ranking of children across the 1990/1 testing period.

Examination of the correlation matrix for the Sand/Concepts about Print/Concepts about Print Test and the Picture Sequencing Task show significant relationships between the later sessions in the children's Kindergarten year. Thus Sand/Concepts about Print S4 and S5 are substantially related to PS S3, S4 and S5 (see Table 5.40). Picture interpretation, story skills, sequencing skills and print knowledge are more closely related when the children have had some literacy instruction in their Kindergarten year.

The Sand/Concepts about Print Test and the Retell Task correlation matrix shows more equivocal results than the previous task comparison. Retell S1 is significantly related to the Sand/Concepts about Print Test S3, S4 and S5 (see Table 5.41), but no further significant relationships are recorded until Retell S4 relates significantly to Sand/Concepts about Print S2, S3, S4 and S5. The relationship between Retell S4 and Sand/Concepts about Print S4 is a strong one. Thus in the middle of their Kindergarten year, after some months of literacy instruction at school, a strong relationship existed

Table 5.39
Correlation Matrix Sand/Concepts about Print/Concepts about Print Test

Session/Task	Sand 1	Sand 2	Sand 3	Sand 4	Sand 5
Sand 1	1				
Sand 2	*.76*	1			
Sand 3	*.65*	*.76*	1		
Sand 4	*.55*	*.80*	*.75*	1	
Sand 5	*.58*	*.71*	*.65*	*.93*	1

between oral story skills and print knowledge. Since the significant relationships between Retell S4 and the Sand/Concepts about Print Test are not maintained in Retell S5 it is difficult to draw meaningful conclusions about the connections between these two tasks.

Table 5.40
Correlation Matrix: Sand/Concepts about Print/Concepts about Print Test and the Picture Sequencing Task

Session/Task	Sand 1	Sand 2	Sand 3	Sand 4	Sand 5
PS 1	-.05	.39	.23	.42	.37
PS 2	0	.26	.36	.33	.31
PS 3	.09	.36	.15	*.49*	*.62*
PS 4	.09	.33	.12	*.48*	*.50*
PS 5	.27	.41	.37	*.62*	*.55*

The Sand/Concepts about Print Test and the Writing Task relate significantly to one another in the last two data gathering sessions of the Writing Task. The Sand/Concepts about Print Test relates to the Writing Task as early as S2 and Writing S4 maintains substantial to strong relationships in S3, S4 and S5. Writing S5 shows substantial relationships with Sand/Concepts about Print S4 and S5. Thus knowledge about print concepts was significantly related to writing skills as early as the end of the children's pre-school year and is substantially to strongly related in S4 and S5 of both tasks when the children have had 6 - 10 months of formal literacy instruction at school.

Table 5.41
Correlation Matrix: Sand/Concepts about Print/Concepts about Print Test and the Retell Task

Session/Task	Sand 1	Sand 2	Sand 3	Sand 4	Sand 5
Retell 1	.32	.44	***.57***	***.53***	***.51***
Retell 2	-.05	.28	.35	.20	.12
Retell 3	.18	.14	.11	.12	.05
Retell 4	.36	***.62***	***.56***	***.75***	***.59***
Retell 5	.30	.41	.20	.44	.40

Table 5.42
Correlation Matrix: Sand/Concepts about Print/Concepts about Print Test and the Writing Task

Session	Sand 1	Sand 2	Sand 3	Sand 4	Sand 5
Writing 1	.17	.17	.17	.17	.19
Writing 2	.39	.13	.10	.11	.21
Writing 3	.26	.12	.05	.16	.26
Writing 4	.24	***.49***	***.67***	***.76***	***.65***
Writing 5	.25	.32	.38	***.59***	***.61***

Table 5.43
Correlation Matrix: Sand/Concepts about Print Test and the Neale Analysis of Reading Ability, Comprehensions One and Two, the Title Recognition Test and the Free-Writing Task

Session/Task	Sand 1	Sand 2	Sand 3	Sand 4	Sand 5
Neale R	.36	.36	.20	***.53***	***.72***
Neale A	***.52***	***.52***	.46	***.76***	***.89***
Neale C	***.61***	***.61***	.38	***.58***	***.71***
Comp 1	***.48***	***.48***	.43	***.63***	***.77***
Comp 2	***.49***	***.64***	***.48***	***.71***	***.80***
TRT	.06	.42	.31	***.62***	***.66***
FWT	.39	.45	.43	***.52***	***.56***

Correlations with 1995 Tasks

Strongest relationships were observed between the Sand/Concepts about Print Test S4 and S5 and all three aspects of the Neale Analysis of Reading Ability (see Table 5.43).Thus the knowledge this group of children had about print in their Kindergarten year was closely related to their reading rate, accuracy and comprehension knowledge four years later. It may be said therefore, that the Sand/Concepts about Print Test, as early as the middle of the children's Kindergarten year, may be a good predictor of reading knowledge (reading rate, accuracy and comprehension) in middle primary school.

Comprehensions One and Two also showed increasingly strong relationships with the Sand/Concepts about Print Test (see Table 5.43) in especially Sessions Four and Five. By S5 the relationships between both tasks showed correlations of .77 and .80. Thus the children's knowledge of print was increasingly related over time to their reading comprehension skills in 1995. The Title Recognition Test showed strong relationships to the Sand/Concepts about Print Test in S4 and S5 (see Table 5.43). Thus the children's knowledge about print in their Kindergarten year was related to the background reading experience revealed by their scores in the TRT.

The Sand/Concepts about Print Test also shows itself as a good predictor of writing knowledge in middle primary school (see Table 5.43) with S4 and S5 of the Sand/Concepts about Print Test relating significantly to S4 and S5 of the Writing Task (1995). Thus print concept knowledge in the last six months of the children's Kindergarten year, after 6 -10 months of formal literacy instruction, predicts writing knowledge four years later in the middle of the children's primary schooling.

The Sand/Concepts about Print Test: Conclusions

Examination of the infit mean squares for each item on this test reveals results which force the conclusion that responses to many items were random. Those ten items which were indicated as part of a latent trait were formed of some of the most basic information which could be provided by the task. In addition, comparison of individual raw scores for this task with Clay's (1991a) normalised scores meant that all but two children fell into the fifth stanine or below it. A total of 11 children (half of the group) were located in the first and second stanines.

It is clear that these children's knowledge of print concepts was limited by the end of their Kindergarten year and certainly was well below that of their peers as demonstrated by other research.

Correlations for this task, however, reveal important predictive information. Significant relationships between the various sessions, some of which are very strong, support the validity of the task. There are also consistently significant relationships between the Sand/Concepts about Print Test, the Environmental Print Task and the Letter Identification Task and less consistent ones with the Reading Task. The later stages of the Sand/Concepts about Print Test, the Picture Sequencing Task and the 1990/1 Writing Task correlate significantly, although correlations with the Retell Task are more ambiguous. Importantly, Sand/Concepts about Print S1 and S2 correlate significantly with two aspects of the Neale Analysis of Reading Ability (Accuracy and Comprehension) and with Comprehensions One and Two. Estimates of print exposure in 1995 in the middle of the children's primary years correlate significantly with the Sand/Concepts about Print Test in S4 and S5 further demonstrating the efficacy of the Sand/Concepts about Print Test as a measure of emergent literacy competence. These correlations also show that reading competence variability can be seen as early as the pre-school year and suggest that the Sand/Concepts about Print Test in the early years of schooling is a good predictor of later reading and writing competence.

1.4 What do the children know about print conventions?

1.4.1 What are their book handling skills?

The children's book handling skills were good by the end of their Kindergarten year and formed a significant item in the latent trait for the task even at the beginning of the data gathering period.

1.4.2 What is their knowledge of directionality?

Early in the data gathering period several items (10, 11) were missing from the latent trait calculations altogether, indicating that no children had scored positively in S1 on these directionality items. In S5 all items to do with directionality appeared on the StarMap but did not fit within the parameters of the latent trait indicating that directionality was still a problem by the end of the children's Kindergarten year.

1.4.3 What kind of knowledge do they have about words?

Results indicate that the children's knowledge about words was minimal over the data gathering period from the middle of pre-school to the end of their Kindergarten year. In S1 few children scored at all on these items and in S5 only two items are part of the latent trait for this task (Items 30 and 46: word by word matching and locates one

and two words on request). Thus whilst knowledge about words had certainly changed, it had not become significant enough to form a part of the latent trait for the Concepts about Print Task.

1.4.4 What knowledge of punctuation conventions do they have?
One item (19: Locates two capital and lower case pairs) of the six punctuation items forms part of the latent trait in Session One. Checks on raw scores show that the other items had zero scores and thus could not appear. Four items appear in Session two with three forming part of the latent trait (40, 41, 43: indicates a full stop in some way, indicates a comma in some way, locates two capitals and two lower case pairs). Whilst punctuation knowledge may be said to be increasingly significant over the data gathering period, this group of children's knowledge of punctuation may be said to be minimal at the end of their Kindergarten year.

2. Is the literacy knowledge they possessed in pre-school and early primary school related to the literacy knowledge they possess in middle primary school?

2.2 Is the literacy knowledge this group of children displayed in pre-school consistent with their literacy development in middle primary school?

Correlations showed that the relationship of the Concepts about Print Task to the 1995 tasks in later primary school was an important one. In particular, knowledge about print in the last half of the children's kindergarten year was strongly related to the rate at which they read, their reading accuracy and their comprehension skills as shown in the Neale Analysis of Reading Ability.

The children's knowledge of print at the end of the eighteen month data gathering period (pre-school/Kindergarten) was closely related to both comprehension tasks in 1995, to their reading experience as indicated in the Title Recognition Test and to their writing skills.

Picture Sequencing Task

Recap of the Nature of the Task
Children were shown four pictures in sequence across two pages and asked to tell the story. (see Appendix 4.7). Each child's performance was examined in terms of the

frequency of specified knowledge related to the task (see Appendix 5.15 and Appendix 5.19).

The Picture Sequencing Task (PS Task) partially addressed research questions 1.4 and 1.5:

1.4 What do the children know about print conventions?

1.4.2 What is their knowledge of directionality?
1.4.5 What changes occur over time?

1.5 What story knowledge do the children have?

1.5.3 Do they display some awareness of story grammar?
1.5.4 Do the children know that meaning can come from pictures?
1.5.6 What changes occur over time?

Coding

Responses to this task were coded in simple format: 1 = no evidence; 2 = positive evidence . The items tested in this task are reproduced as follows for ease of interpretation of StarMaps and Item Maps.

Item 1(5) = Evidence of developing directionality
Item 2(6) = Able to infer meaning from pictures
Item 3(7) = Has an idea of story sequence
Item 4(8) = Understands the point of the story

NB Items 1-4 = Session 1; Items 5 - 8 = Session 5

Analysis

In S1, 8 children of the 27 tested had zero scores, displaying little knowledge of directionality or story sequence and seemingly unaware that meaning can be made from pictures in a sequence. There were three children who had perfect scores: Carl, Kiagh and Gregory. Eighteen months later, at the end of their Kindergarten year at school, there were no children with zero scores and eight children with perfect scores.

Mean Scores

This task was completed by 22 children in both S1 and S5. In S1 out of a possible 88 positive responses, 32 were noted. In S5, 63 responses out of a possible 88 were observed. Thus there were almost double the number of positive responses on the items

in S5 than in S1. Mean scores improved from 1.45 to 2.86 as shown below in Table 5.44.

Table 5.44
Picture Sequencing Task: Mean Scores

Session	Mean Score
1	1.45
2	2.13
3	2.45
4	2.95
5	2.86

Rasch Analysis

The summary of fit statistics (Appendix 5.7) for this task shows an infit mean square of 0.95 and a reliability estimate of 0.93 indicating few reversals in the data. Examination of the StarMap of Item Fit (see Figure 5.11) for the Picture Sequencing Task shows that three of the eight items are clustered within latent trait parameters. It must also be remembered that, in actuality, there are only four items in this task. The eight items represent the two data gathering sessions put together. Item 4 does not appear since only zero scores were recorded. Item 6 does not appear since only perfect scores were recorded. Thus story sequencing knowledge and directionality knowledge along with a clear knowledge that pictures have meaning appear as the important items in this task.

Table 5.45
Picture Sequencing Task: Rasch Parameter Item Difficulty over Time, Estimates and Ranks

Item	Difficulty Delta	Infit Mean Square	Rank
1	1.79	.99	7
2	- 1.38	1.69	2
3	1.36	1.14	6
4	Zero	Score	8
5	-1.38	1.69	2
6	Perfect	Score	1
7	.49	1.09	5
8	-.87	.63	4

Rasch Parameter estimates (see Table 5.45) show the infit mean squares for each item, the difficulty delta, and the item ranking. The ability to infer meaning from pictures in S5 was clearly the easiest item for the group followed by the same item in S1 and knowledge of directionality in S5. The most difficult item was understanding the point

of the story in S1. In S5 understanding the point of the story was ranked as the fourth in order of difficulty. The performance on this item in both sessions seems, to the researcher, to be problematical.

```
--------------------------------------------------------------------------------
Item Fit
all on all (N = 22 L = 8 Probability Level= .50)
--------------------------------------------------------------------------------
INFIT
 MNSQ        .53       .63       .77      1.00      1.30      1.60      1.90
--------------+---------+---------+---------+---------+---------+---------+-----
  1 item 1                        .         *         .
  2 item 2                        .         |         .             *
  3 item 3                        .         |    *    .
_________________________________________ Session 1 ____________________________
  5 item 5        *               .         |         .
  7 item 7                        .         |   *     .
  8 item 8                *       .         |         .
                                    Session 5
================================================================================
```

Figure 5.11
Picture Sequencing Task: StarMap of Item Fit

Correlations with 1990/1 Tasks

Correlations between the PS Task and the EPT, the letter ID Task, the Sand/Concepts about Print Test, and the Reading Task have been discussed in previous sections under the relevant headings for those tasks.

Examination of the correlation matrix for the PS Task shows that most correlations of significance occur in the latter part of the 1990/1 data gathering period. Thus once the children are in their Kindergarten year at school and receiving formal literacy instruction the relationships between the later sessions (S1, S2 and S3) become stronger (see Table 5.46).

Table 5.46
Correlation Matrix: Picture Sequencing Task, Sessions 1 - 5

Session/Task	PS 1	PS 2	PS 3	PS 4	PS 5
PS 1	1				
PS 2	.32	1			
PS 3	.41	.45	1		
PS 4	.3	*.49*	*79*	1	
PS 5	.01	.28	*.49*	*.63*	1

The correlation matrix for the Picture Sequencing Task and the Retell Task shows relationships of a substantial nature between Retell S1 and PS S2-S5 (see Table 5.47). Thus the ability to retell a story in the middle of the pre-school year is significantly related to the ability to interpret a sequence of pictures from the end of the pre-school year to the end of the Kindergarten year. The strongest relationships with the PS Task, however, occur between the later sessions Retell S5 and the PS Task S5 show a correlation of .80. A very strong connection is consequently identified between the ability to retell a story and the ability to interpret a sequence of pictures in story form at the end of the children's Kindergarten year. The conclusion must be drawn, therefore, that there has been some considerable development over the 1990/1 data gathering period which points to skill development in story grammar and sequencing.

Table 5.47

Correlation Matrix: Picture Sequencing Task, Sessions 1 - 5 and Retell Task, Sessions 1 - 5

Session/Task	PS 1	PS 2	PS 3	PS 4	PS 5
Retell 1	.45	***.54***	***.52***	***.61***	***.57***
Retell 2	***.55***	***.73***	.2	.34	.03
Retell 3	.17	.04	.14	.42	***.50***
Retell 4	***.53***	.45	.42	***.55***	***.72***
Retell 5	.31	.02	***.63***	***.73***	***.80***

Table 5.48

Correlation Matrix: Picture Sequencing Task, Sessions 1 - 5 and the Writing Task, Sessions 1 - 5

Session/Task	PS 1	PS 2	PS 3	PS 4	PS 5
Writing 1	-.02	.09	.29	.36	.28
Writing 2	-.20	0	.18	.24	.17
Writing 3	-.01	.13	.22	.27	.03
Writing 4	.14	.20	.26	.22	.38
Writing 5	-.05	0	.38	.36	.36

There are no significant connections evident between the Writing Task and the PS Task (see Table 5.48). This is not unexpected since, in the 1990/1 data gathering sessions, the children were unable to execute a coherent piece of writing in a story form which might have involved some story knowledge.

Correlations with 1995 Tasks

Examination of the correlation matrix for the 1995 tasks and the PS Task reveals correlations which are somewhat difficult to interpret. Picture Sequencing Task skills are clearly related to print experience from the beginning of the children's Kindergarten year onwards as is reading accuracy as determined by the Neale Analysis and the comprehension skills tested in the Comprehension Two Task (See Table 5.49). The second comprehension task involved a large proportion of inferential questions and it is possible that these kinds of questions are related to making inferences about the nature of a story from pictures although such a contention would need further investigation and is peripheral to the purpose of this study.

It is the PS Task at the beginning of the children's Kindergarten year, however, which shows substantial to strong connections with all 1995 tasks except the Writing Task (up to .72). Consequently, it may be inferred that, at the commencement of their Kindergarten year, children's performance in the PS Task is substantially to strongly related to their rate of reading, reading accuracy and comprehension as tested by the Neale Analysis. It is also related to their performance in the first and second comprehension tasks and their print exposure as measured by the Title Recognition Test. In this sense then, the PS Task by the beginning of the children's Kindergarten year (1991) may be said to predict performance in three major aspects of reading and to demonstrate print exposure four years later (1995).

Table 5.49

Correlation Matrix: Picture Sequencing Task, Sessions 1 - 5 and the Neale Analysis, Comprehensions One and Two, the Title Recognition Test and the Writing Task (1995).

Session/Task	PS 1	PS 2	PS 3	PS 4	PS 5
Neale R	.17	.05	***.61***	.45	.43
Neale A	.41	.38	***.72***	***.50***	***.50***
Neale C	***.60***	***.60***	***.52***	.40	.32
Comp 1	.29	.29	***.58***	.37	.43
Comp 2	***.53***	.40	***.67***	***.50***	***.55***
TRT	.43	.19	***.72***	***.59***	***.54***
FWT	***.56***	.32	.28	.28	.30

Picture Sequencing Task: Conclusions

This task clearly has problems in terms of its ability to examine development in directionality, story sequencing and understanding story meaning. Whilst frequency counts show indications of increased knowledge of the items, it appears that these may be indications only of unrelated responses since latent trait analysis can identify only three of the eight items as part of an underlying attribute. In addition two of the items, do not form part of the statistical analysis since they achieved either zero or perfect scores, a large proportion given that there are a total of only eight items.

The PS Task at the beginning of the children's Kindergarten year may be said to predict performance in three major aspects of reading and to demonstrate print exposure four years later in 1995.

There are a number of possible explanations for the questionable results of this task: concepts tested by this task may be a problem for this group of children for cultural reasons; the method of testing these concepts through the vehicle of sequential pictures may also be a problem for cultural reasons.

The Retelling Task and the Reading Task, because they examine some of the same concepts, may have more information to tell us concerning children's story knowledge and knowledge of print conventions and may thus provide reasons for some of the possible problems.

Research Questions 1.4 and 1.5:

1.4 What do the children know about print conventions?
- 1.4.2 What is their knowledge of directionality?
- 1.4.5 What changes occur over time?

Latent trait analysis indicated development over time in this particular aspect of the Picture Sequencing Task.

1.5 What story knowledge do the children have?
- 1.5.3 Do they display some awareness of story grammar?
- 1.5.4 Do the children know that meaning can come from pictures?
- 1.5.6 What changes occur over time?

The problems children had in arriving at an understanding of the point of the story and the equivocal nature of the results of the statistical analysis preclude any clear

understanding of their performance over time in terms of Question 1.5.3. However, changes in their ability to infer meaning from pictures are certainly indicated in both the mean scores and the statistical analysis. As well as this, the PS Task appears to be able to predict aspects of literacy performance, especially in reading, writing and print exposure four years later.

Retell Task

Recap of the Nature of the Task

Children were asked to choose a story from unknown storybooks that they would like to hear. The researcher read the chosen story and asked the child to retell the story. Responses were observed and recorded (see Appendix 4.8 and Appendix 5.16).

The Retell Task addressed the following research questions:

1.5 What story knowledge do the children have?
- 1.5.2 Do the children use literary/book language?
- 1.5.3 Do they display some awareness of story grammar?
- 1.5.5 What levels of sentence complexity do they use *orally* and in writing?
- 1.5.6 What changes occur over time?

Coding

Responses for all thirteen items were coded as indicated in a simple format: 0 = no evidence of indicator; 1 = evidence of indicator. The data were coded in twenty-six columns: S1 data, Items 1 - 13; S5 data, Items 14 - 25. The data is based on the twenty-one children who completed this task in Sessions 1 and 5. The items for analysis are reproduced as follows for easy interpretation of StarMaps and Item Maps (the S5 item numbers are given in brackets).

1 (14). Commented on characters
2 (15). Commented on main events/points
3 (16). Recalled story details
4 (17). Indicated some awareness of sequence or chronology
5 (18). Commented on the plot or on causes and effects
6 (19). Commented on the setting
7 (20). Signalled openings and closures
8 (21). Understood the underlying idea or point of the story
9 (22). Expression in sentences

10 (23). Used conjunctions/complex sentences
11 (24). Mispronunciations
12 (25). Indications of dialectal difference evident
13 (26). Used dialogue or repetition found in the story

Analysis

Each child's performance in the Retell Task was examined in terms of the indicators observed which were expressions of the research questions listed above. The number of indicators present in each child's performance was recorded (see Appendix 5.16).

Table 5.50
Retell Task: Mean Scores

Max score = 13

Session	Mean Scores
1	5.33
2	5.47
3	6.52
4	6.59
5	6.56

Mean Scores

Of a total possible score of 286 (22 X 13) children scored 132 in S1. In S5 a total of 146 was scored indicating the group made some advancement in story knowledge over the eighteen month period between S1 and S5 Examination of the mean scores for each session in this task (see Table 5.50), however, show only a small progression over the eighteen month data gathering period in 1990/1 although strictly speaking, confirmation of such a statement requires testing for growth via ANOVA.

Rasch Analysis

The summary of fit statistics (Appendix 5.7) for this task shows an infit mean square of .96 and a reliability estimate of 0.94 indicating few reversals in the data.

Examination of the StarMap of item Fit to a Latent Trait for the twenty-one children who completed the Retell Task in both S1 and S5 (see Figure 5.12) shows that in S1 Items 6 and 7 are missing. The item estimates table in Appendix 5.17 shows that no children scored on these two items. Thus in S1 no children commented on the settings of their stories or signalled openings and closures in their retellings. However, both of

NB Session 5 items are printed in bold

Item Estimates (Thresholds)
all on all (N = 21 L = 32 Probability Level= .50)

4.0			
		19	**26**
3.0			
		13	
	X		
2.0			
	XX	**20**	**23**
		4	**17**
1.0	X		
	XXXX	5	8
	XXX	**25**	
.0		10	12
	X		
	XXXXX	**16**	**18**
	X	11	
-1.0	XXX	3	
		15	**24**
		2	**21**
-2.0			
		1	9
-3.0		**22**	

Each X represents 1 students
Retell Task: Item Difficulty over Time

Figure 5.12

Retell Task: Item Difficulty over Time

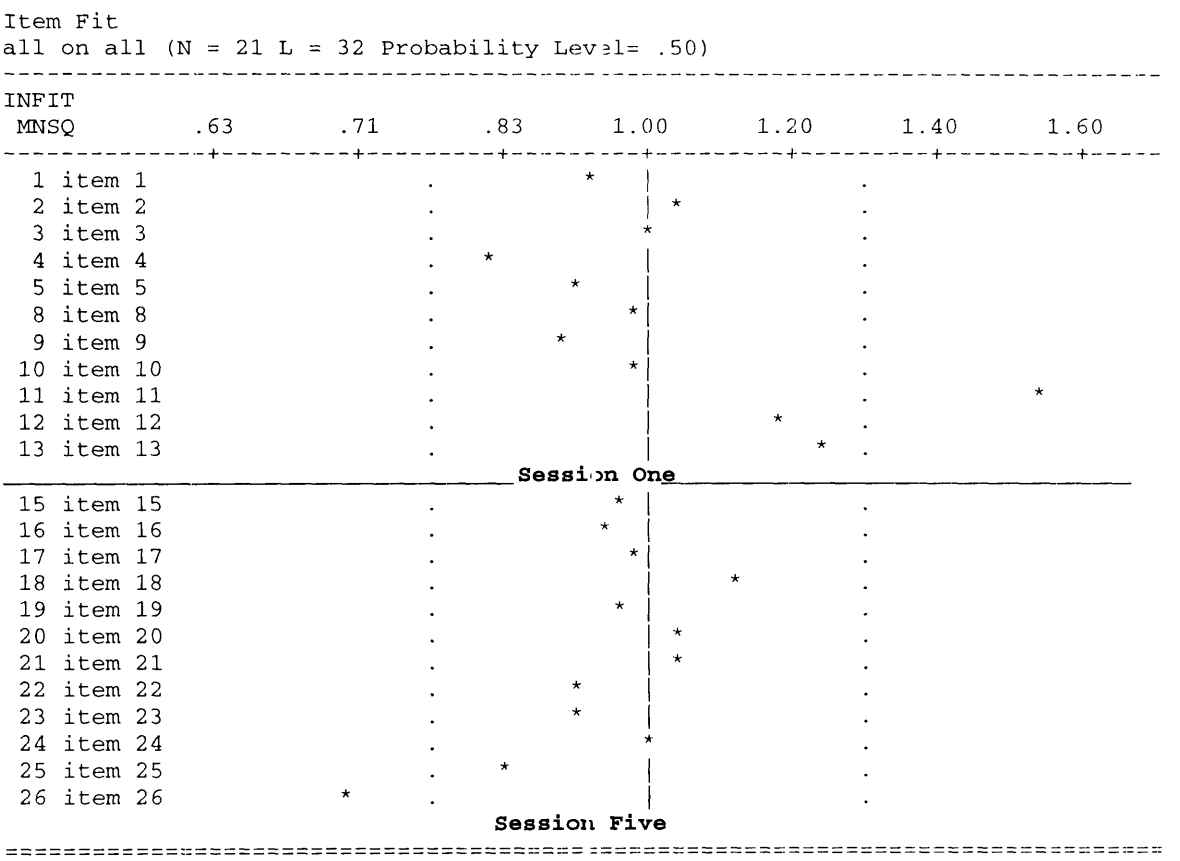

Figure 5.13

Retell Task: StarMap of Item Fit

these items do fit latent trait parameters in S5 (Items 20 & 21) indicating a change or development in learning for these items.

Of the items which do appear on the StarMap, Items 11 and 26 appear as random items, falling outside latent trait parameters. Item 11 concerns mispronunciations in S1. In S5, the same item (Item 24) does fall within latent trait parameters. The only other item outside the StarMap of Item Fit is Item 25. Thus in S5 the item concerning use of dialogue and repetition from the story does not fit latent trait parameters.

Item 14 is missing from the StarMap. Examination of the Item Estimates for the Retell Task (Appendix 5.17) shows that all children scored on this item. Thus all children commented on the characters in their story retelling. Examination of the infit mean squares for each item in Figure 5.12 reflects the above analysis. Figure 5.12, the map of Item Difficulty records the distribution of the children's ability in this task juxtaposed with the sequence of difficulty of the items as they appear distributed on a logit scale.

Correlations with 1990/1 Tasks

Correlations between the Retell Task and the EPT, the Letter ID Task, the Reading Task, the Sand/Concepts about Print Test and the PS Task have been discussed previously.

Examination of the correlations for each session of the Retell Task reveal somewhat ambiguous information. Retell S1 correlates significantly with Retell S2 and S4 (see Table 5.51). Retell S2 does not correlate significantly with any other session. Both Retell S3 and S4 show substantial relationships with Retell S5. Such correlations call into question the reliability of the task since relationships which might be expected to be significant show as weak or non-existent. Another possibility is that such results could be a function of the children being able to choose the story.

The correlation matrix between the Retell Task and the 1990/1 Writing Task also shows tenuous connections between the sessions (see Table 5.41). Retell S1 correlates significantly with Writing S1, S4 and S5 and Retell S4 shows a moderate relationship with Writing S4. These are the only significant relationships between the tasks. Thus the ability to retell a story in the middle of the children's pre-school year is related to their writing ability at the same time and to their writing abilities in the latter part of their Kindergarten year. Again, in the middle of their Kindergarten year their writing ability is moderately related to their ability to retell a story.

Table 5.51

Correlation Matrix: Retell Task, Sessions 1 -5

Session/Task	Retell 1	Retell 2	Retell 3	Retell 4	Retell 5
Retell 1	**1**				
Retell 2	***.49***	**1**			
Retell 3	.40	.08	**1**		
Retell 4	***.54***	.22	.44	**1**	
Retell 5	.44	-.08	***.60***	***.57***	**1**

Correlations with 1995 Tasks

The Retell Task revealed only a few significant connections with the 1995 tasks (see Table 5.53). Retell S1 in the middle of the children's pre-school year correlated moderately with children's accuracy scores in the Neale Analysis four years later. Retell S4 in the middle of the children's Kindergarten year correlated substantially with Neale

Table 5.52

Correlation Matrix: Retell Task, Sessions 1 -5 and the Writing Task, Sessions 1- 5

Session/Task	Retell 1	Retell 2	Retell 3	Retell 4	Retell 5
Writing 1	***.62***	.21	.15	.12	.34
Writing 2	.40	.05	-.12	-.03	.17
Writing 3	.38	.27	-.11	-.01	.10
Writing 4	***.49***	.27	-.02	***.48***	.23
Writing 5	***.55***	.08	-.03	.37	.31

Accuracy scores, Comprehension Two scores and the Title Recognition Test. Thus Retell scores in the middle of the children's Kindergarten year appear able to predict performance four years later in reading accuracy and comprehension and be connected significantly to print exposure. However, Retell S5 correlates significantly only with the Title Recognition Test. Because of these somewhat equivocal results, it was considered that such tasks as the Sand/Concepts about Print Test, the EPT and the Letter Identification Task provided more consistently interpretable correlations in terms of reliability and predictability.

Table 5.53

Correlation Matrix: Retell Task Sessions 1 - 5 and the Neale Analysis, Comprehensions One and Two, the Title Recognition Test and the Free-Writing Task

Session/Task	Retell 1	Retell 2	Retell 3	Retell 4	Retell 5
Neale R	.26	-.30	-.03	.36	.35
Neale A	***.47***	.02	-.03	***.52***	.32
Neale C	.44	.10	.14	.37	.20
Comp 1	.30	-.06	-.13	.44	.25
Comp 2	.42	.01	.05	***.62***	.43
TRT	.40	.03	.12	***.55***	***.52***
FWT	.43	.18	.30	.35	.22

Retell Task: Conclusions

Only two items in this task did not fit latent trait parameters indicating a good fit between the data and the model. All children commented on the characters in the stories they retold. Only one child used dialogue and/or repetition from the story in the S5

retelling whereas two children had used it in S1. This phenomenon placed this item outside latent trait parameters.

Correlations between the Retell Task and the EPT did not allow firm conclusions to be drawn about significant relationships between the two tasks although there were clear relationships between Retell Task and the letter ID Task in the last half of the children's Kindergarten year indicating that formal literacy instruction during the year intensified the relationships between the two tasks. Only one significant relationship between the Retell Task and the Reading Task was recorded precluding any meaningful conclusions about the relationship between the two tasks. Substantial to strong relationships were drawn between the Retell Task in the middle of the children's Kindergarten year and the Sand/Concepts about Print Test from the end of pre-school onwards indicating a possible connection between print knowledge and the ability to retell a story very early in children's literacy development.

The Retell Task does not compete with other tasks such as the Sand/Concepts about Print Test, the Letter ID Task and the EPT as a predictor of later literacy performance in 1995 since significant relationships with the later tasks were much fewer and less consistent. Thus it seems that a purely speech-based task such as the Retell Task is about the weakest predictor of Year 5 reading performance, supporting the notion of a degree of independence between reading and oral language generally.

Research Questions

1.5 What story knowledge do the children have?

1.5.2 Do the children use literary/book language?

1.5.3 Do they display some awareness of story grammar?

Rasch Analysis reveals some awareness of story grammar but Item Estimates (See Appendix 5.17) show that a number of items revealed lower scores in S5 than S1. Thus whilst most items fall within latent trait parameters and are clearly relevant to the task, children's knowledge is somewhat unstable.

1.5.5 What levels of sentence complexity do they use *orally* and in writing?

Items Nine and Ten in S1 (22 and 23 in S5) all appear as relevant to the latent trait. Thus expression in sentences, using complex sentences and connectives contribute to the children's story knowledge. The use of connectives is, however, problematic since the incidence of their use actually goes down between S1 and S5. If we remember that

Ferreiro and Teberosky (1982), Weber (1990) and Cox et al. (1990) found significant correlations between the use of connectives and oral reading competence, it may well be that the oral language the children brought to school affected their performance in this aspect of the task. Thus we may be looking at indicators of cultural difference which are affecting performance.

1.5.6 What changes occur over time?

Knowledge remained fairly stable - a fact which may be significant in itself, since with more intensive literacy instruction occurring in their pre-school year it might be expected there would be clearer evidence of developing knowledge. This, too, indicates an independence between speech-based processing and literacy, more narrowly defined.

The Writing Task

Recap of the Nature of the Task

The Writing Task consisted of two parts. In the first part children were asked to write their names and anything else they could write. In the second part, they were asked to write a letter to a favoured person such as Santa Claus or grandparents or Easter Bunny and anything else they could write. The children's attempts at writing were then analysed in terms of the indicators for the task.

The Writing Task addressed the following research questions:

1.1 Are children aware of the purposes of reading and writing?
- 1.1.1 Do the children know that print carries meaning?
- 1.1.2 What evidence is there of changes over time?

1.3 What level of grapho-phonic knowledge is evident?
- 1.3.2 Can the children write letters and/or sounds?
- 1.3.5 What changes occur over time?

1.4 What do the children know about print conventions?
- 1.4.2 What is their knowledge of directionality?
- 1.4.4 What knowledge of punctuation conventions do they have?
- 1.4.5 What changes occur over time?

1.5 What story knowledge do the children have?
- 1.5.1 Do the children use drawing in their attempts at written language?

1.5.5 What levels of sentence complexity do they use orally and in writing?

1.5.6 What changes occur over time?

1.7 What other knowledge do the children have about writing?

1.7.1 Do the children have a bank of words they can reproduce in writing at will?

1.7.2 What are the characteristics of their writing?

1.7.3 Do the children have an awareness of conventional writing forms such as letters?

1.7.4 Are there changes over time?

Coding

Responses for all sixteen items were coded in simple ordinal format as set out below. The data were coded in thirty-two columns: S1 data, Items 1 - 16; S5 data, Items 17 - 32. The data is that of the twenty-two children who completed this task in both S1 and S5. Items used for analysis are listed as follows (the S5 items are in brackets) for ease of interpreting the StarMaps and the Item maps.

1 (17). Knowledge of what writing is:

1.1 0 = no evidence

1.2 1 = evidence (used drawing)

1.3 2 = limited (knows to make marks on page resembling printing or cursive writing)

1.4 3 = good evidence (knows writing is communication)

2 (18). Approximations of printing:

2.1 0 = no evidence

2.2 1 = evidence

3 (19). Approximations of cursive writing:

3.1 0 = no evidence

3.2 1 = evidence

4 (20). Quality of printed letter formation:

4.1 0 = no printing evident

4.2 1 = limited (reversals, roughly recognisable approximations)

4.3 2 = good (letter formation clear, and correct)

5 (21). Quality of letters in cursive writing:

5.1 0 = no cursive writing evident

5.2 1 = limited (approximations of the form of cursive writing)

5.3 2 = good

6 (22). Writes recognisable correspondence format:

5.1 0 = no evidence

5.2 1 = limited (eg signs name, approximations of address format, "Dear....." format, 'reads' back any of the former.

5.3 2 = evidence

7 (23). Stock of words constructed from memory with letters correctly sequenced:

7.1 0 = none

7.2 1 = one

7.3 2 = 2 - 3 words

7.4 3 = more than three

Items 8 - 11 concern evidence or not of directional knowledge and whether part of the directional pattern is known.

8 (24). Start top left:

8.1 0 = no

8.2 1 = partially (top left quadrant)

8.3 2 = yes

9 (25). Move left to right:

9.1 0 = no

9.2 1 = partially (eg part of the writing has this characteristic)

9.3 2 = yes

10 (26). Return down left:

10.1 0 = no

10.2 1 = partially (eg part of the writing has this characteristic)

10.3 2 = yes

11 (27). Reversal of the directional pattern (right to left and return down right):

11.1 0 = no

11.2 1 = partially (eg part of the writing has this characteristic, no return down right)

11.3 2 = yes

12 (28). Held the pencil in a conventional manner for writing

12.1 0 = no

12.2 1 = yes

13 (29). Sounded out while writing:

13.1 0 = no

13.2 1 = yes

14 (30). Used punctuation:

14.1 0 = no

14.2 1 = yes

15 (31). Wrote or 'read' back in sentences:

15.1 0 = no

15.2 1 = yes

16 (32). Able to write name:

15.1 0 = no

15.2 1 = partially (some letters of name recognisable)

15.3 2 = yes

Analysis

Each child's performance in the Writing Task was examined in terms of the writing indicators displayed (see Appendix 3.1) which were expressions of the research questions. The number of indicators present in each child's performance was recorded (See Appendix 5.18).

Mean Scores

Of a total possible score of 616 (22 X 28) children scored 164 in S1. In S5 a total of 365 was scored indicating the group made an advancement in knowledge about writing over the eighteen month period between S1 and S5 peaking at S4 and showing a considerable

leap between S3 and S4 after some months of formal literacy instruction (see Table 5.54).

Table 5.54
Writing Task: Mean Scores

Max Score = 56

Session	Mean Scores
1	23.40
2	25.00
3	23.24
4	40.13
5	32.63

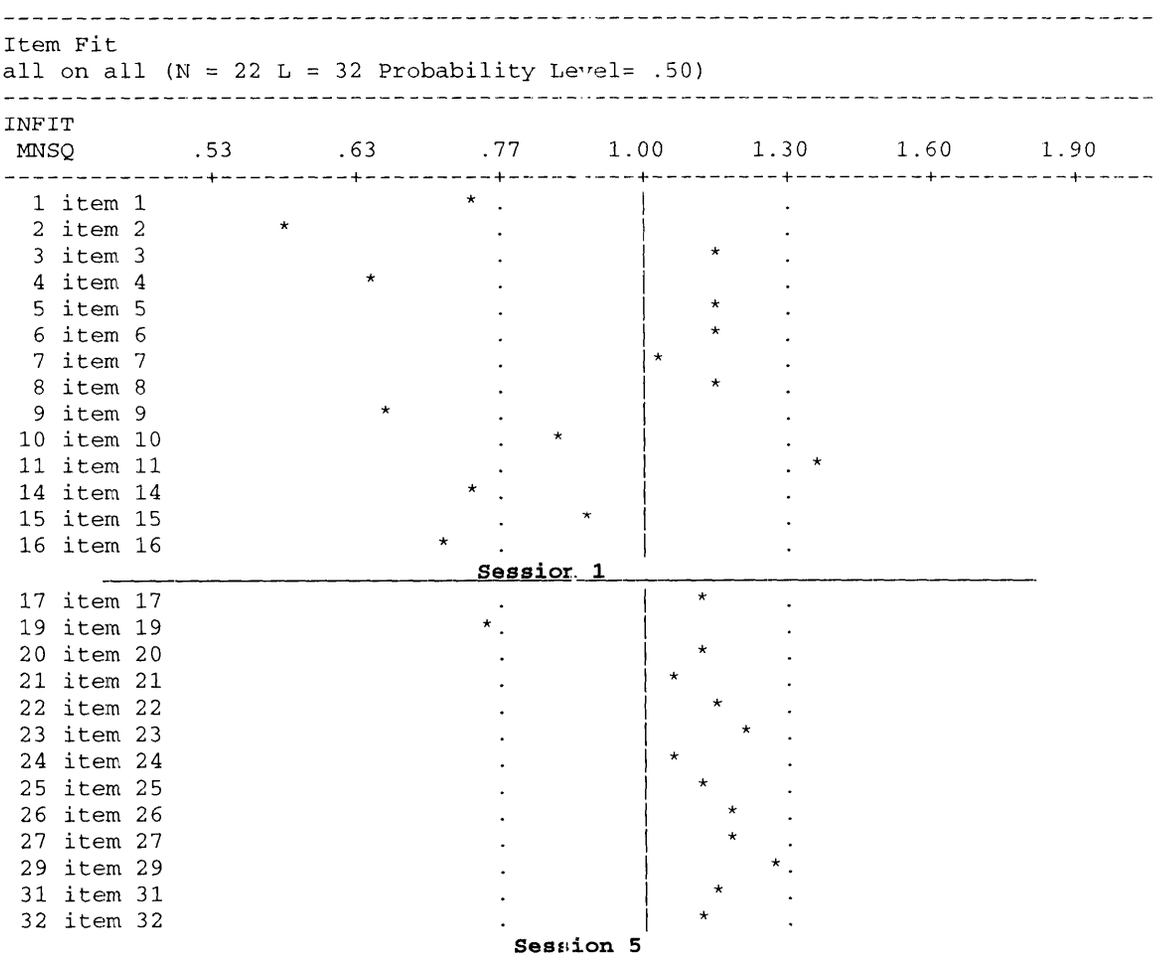

Figure 5.15
Writing Task: StarMap of Item Fit

Rasch Analysis

The summary of fit statistics (Appendix 5.7) for this task shows an infit mean square of .99 and a reliability estimate of 0.93 indicating few reversals in the data.

Examination of the StarMap of Item Fit for the 22 children who completed the Writing Task in both S1 and S5 (see Figure 5.15) shows that five items are missing from the display. Appendix 5.18 confirms that Items 12 (S1) and 28 (S5), which are both concerned with whether the child was holding the pencil conventionally, have perfect scores. Item 28 also had a perfect score in that all children in S5 could approximate printing. In Item 13, no child sounded out while writing and none of the 22 children who completed S1 and S5 used punctuation. Thus these five items are not part of the statistical calculations of the Rasch Analysis.

Of the remaining 27 items, nineteen fall inside latent trait parameters. Eight items fall outside the parameters indicating random results. Thus knowledge of what writing is (Item 1), approximations of printing (Item 2), the characteristics of the children's printing (Item 4), proceeding from left to right on a line whilst writing (Item 9), reversing the directional pattern of writing (Item 11), using punctuation (Item 14), ability to write one's name (Item 16) and approximations of cursive writing (Item 19) all appear as random effects on the StarMap. Interestingly, all these items excepting the last one occur in S1 and Item 19 is very close to the dotted line and is almost inside latent trait parameters. None of their counterparts in S5 appear as random effects, giving rise to speculation that by S5 relevant learning in these areas had taken place. This is further supported by Raison and Rivalland (1994) in that the results fit what might be expected from the writing continuum. In relation to directionality, evidence from the Reading Task also supports the contention that significant learning had taken place (see Items 12 and 40 Appendix 5.11).

The following related nineteen items were inside latent trait parameters:

3.	Approximations of cursive writing (S1)
5 & 21.	Quality of letters in cursive writing (S1)
6 & 22.	Writes recognisable correspondence format (S1 & S5)
7 & 23.	Stock of words constructed from memory with letters correctly sequenced (S1 & S5)
8 & 24.	Starting top left (S1 & S5)
10 & 25.	Returning down left (S1 & S5)
15.	Wrote or 'read' back in sentences (S1)
17.	Knowledge of what writing is (S5)
20.	Quality of printed letter formation (S5)

NB S5 Items are printed in bold

```
-----------------------------------------------------------------------------
Item Estimates (Thresholds)
all on all (N = 22 L = 32 Probability Level= .50)
-----------------------------------------------------------------------------
 3.0                          |
                              |
                              |      6     14     21
                              |
                              |
                              |
                              |
 2.0                          |     29
                              |     19.2
                              |
                           X  |
                              |      7     15.2   22
                              |
                              |      8.2   19.1   27.2
                              |     15
 1.0                       X  |      1.3   27.1
                              |     23.3
                              |      8.1   11.2
                           X  |      3      5
                              |
                          XX  |
                              |     10.2   15.1
                           X  |
  .0                          |     11.1
                           X  |      9.2   10.1
                           X  |
                          XX  |      9.1
                          XX  |
                           X  |      4
                              |      2     23.2
-1.0                       X  |
                           X  |     17.3
                              |
                          XX  |
                              |
                              |
                           X  |      1.2   25.2
                              |     31
-2.0                       X  |     24.2   25.1
                          XX  |     20.2
                              |     24.1
                           X  |
                              |
                              |
                              |
                              |
-3.0                          |
                              |
                              |
                              |
                              |
                              |     23.1
                              |
                              |
-4.0                          |
-----------------------------------------------------------------------------
  Each X represents    1 student
NB Explanation of the item numbers may be found at the beginning of the analysis of
this task.
```

Figure 5.16

Writing Task: Map of Item Difficulty

25. Move left to right (S5)
27. Reversal of the directional pattern (S5)
29. Sounded out whilst writing (S5)
31. Wrote or 'read' back in sentences (S5)
32. Able to write name (S5)

Figure 5.16 records children's ability in this task and the level of difficulty of the items as they appear on a logit scale.

Correlations with 1990/1 Tasks

Correlations between the Writing Task (WT) and the EPT, the Letter ID Task, the Sand/Concepts about Print Test, the Reading Task, the Picture Sequencing Task and the Retell Task have been discussed in the analyses of those tasks.

Table 5.55
Correlation Matrix: Writing Task Sessions 1 - 5

Task	Writing 1	Writing 2	Writing 3	Writing 4	Writing 5
Writing 1	**1**				
Writing 2	***.69***	**1**			
Writing 3	***.52***	***.83***	**1**		
Writing 4	.37	.20	.35	**1**	
Writing 5	.42	.36	.46	***.68***	**1**

Table 5.56
Correlation Matrix: Writing Task Sessions 1 - 5 and the Neale Analysis, Comprehensions One and Two, the Title Recognition Test and the Free-Writing Task

Task	Writing 1	Writing 2	Writing 3	Writing 4	Writing 5
Neale R	.22	.35	.26	.27	.41
Neale A	.27	.25	.25	***.57***	.46
Neale C	.10	.09	.08	.17	.09
Comp 1	.12	.02	-.14	.26	.37
Comp 2	.16	.08	-.03	.26	.24
TRT	.26	-.07	-.14	.39	.44
FWT	-.12	-.02	.11	.24	.02

Examination of the WT S1 shows significant correlations detailing substantial relationships with S2 and S3 (see Table 5.55). Since children had few writing skills during this part of the 1990/1 testing period, this is not unexpected. A strong correlation exists between WT S2 and WT S3 for the same reason. No other significant relationships are shown on this matrix except for that between WT S4 and WT S5. Since S4 and S5 were conducted after the children had had formal literacy instruction for a period of 6 - 10 months, relationships between these two sessions may be expected to be significant supporting the validity of the task. Other relationships between the various data gathering sessions are not so clear.

Correlations with 1995 Tasks

Examination of the correlations between the 1990/1 WT and the 1995 tasks indicates that the WT (1990/1) is clearly not to be relied upon as a predictor of children's literacy (see Table 5.56). Only one significant relationship is indicated - that between WT S4 and reading accuracy in the Neale Analysis. Thus no meaningful conclusions may be drawn concerning the predictability of the 1990/1 WT in relation to later literacy learning. In particular, there are no significant relationships between the WT (1990/1) and the WT (1995). Thus children's writing skills in 1990/1 have no clear relationships with their writing skills in 1995. It is more than likely that the reasons for this are closely linked to the children's inexperience with writing in pre-school although this is pure speculation. Certainly, the fact that there are no clear relationships between the children's writing in the two periods discussed, narrows the range of pre-school variables which emerge as the foundations of literacy growth.

Writing Task: Conclusions

Eleven items have been excluded from the results of this task: two have perfect scores, three have zero scores and eight reveal random results not associated with a latent trait. Examination of the eight random items shows that these items are highly relevant to the writing development process. Further examination of the data shows that these same items do appear in S5 as related to a latent trait clearly indicating that some significant change has taken place during the eighteen month period between S1 and S5.

The various sessions of the WT did not correlate with one another in any consistent fashion. There were, however, some substantial to strong relationships recorded. Relationships between the EPT and the WT are ambiguous and patterns do not allow any firm conclusions to be made. Similarly, relationships between the WT and the Letter ID Task do not support drawing of conclusions which may shed light on the children's literacy learning. The correlations between the Reading Task and the Writing

Task (1990/1) show a few significant correlations operating during the children's Kindergarten year but not really enough to be able to draw clear inferences.

Correlations between the Sand/Concepts about Print Test show that knowledge about print concepts was significantly related to writing skills as early as the end of the children's pre-school year and was substantially to strongly related in S4 and S5 of both tasks when the children have had 6 - 10 months of formal literacy instruction at school. There were no significant relationships between the WT and the PS Task. The ability to retell a story in the middle of the children's pre-school year was related to their writing ability at the same time and to their writing abilities in the latter part of their Kindergarten year as the correlation matrix for the Retell Task and the Writing Task shows. In the middle of their Kindergarten year the children's writing ability was moderately related to their ability to retell a story.

The WT did not correlate significantly with any of the 1995 tasks and thus is not a good predictor of later literacy competencies as some of the other tasks are.

Research Questions:

1.1 Are children aware of the purposes of reading and writing?
  1.1.1 Do the children know that print carries meaning?
  1.1.2 What evidence is there of changes over time?

By the end of their kindergarten year the group knew that print carried meaning. Observation of the differences between S1 and S5 (Figure 5.14) shows clear changes in the groups perceptions of the writing process.

1.3 What level of grapho-phonic knowledge is evident?
  1.3.2 Can the children write letters and/or sounds?
  1.3.5 What changes occur over time?

Items show that the group's ability to write letters in both printing and cursive modes increased over the eighteen month period. All items concerning this aspect of writing appear inside latent trait parameters for S5 in the StarMap (see Figure 5.14).

1.4 What do the children know about print conventions?
  1.4.2 What is their knowledge of directionality?
  1.4.4 What knowledge of punctuation conventions do they have?
  1.4.5 What changes occur over time?

Whilst the group's knowledge of punctuation was still minimal at the end of their Kindergarten year, there is clear evidence of positive changes in terms of their knowledge of directionality (see Figure 5.14).

1.7 What other knowledge do the children have about writing?

1.7.1 Do the children have a bank of words they can reproduce in writing at will?

1.7.2 What are the characteristics of their writing?

Whilst only a few children had a bank of words which they could reproduce at will by the end of their Kindergarten year, they could write their names and hold the pencil in a conventional manner and many could read back what they had written in sentences reinforcing the notion that they knew about the purposes of writing and what writing was.

1.7.3 Do the children have an awareness of conventional writing forms such as letters?

1.7.4 Are there changes over time?

The group had little knowledge of conventional correspondence formats by the end of their Kindergarten year.

The 1995 Tasks

Recap of the Nature of the Tasks

In December 1995 the children completed five tasks for literacy assessment purposes. The Neale Analysis of Reading Ability asked children to read a number of graded reading passages, assess rate of reading, accuracy and comprehension and diagnose reading difficulties in a broad sense. The two comprehension exercises looked at grapho-phonic knowledge, comprehension and fluency. Children were asked to read selected passages and answer questions verbally afterwards. The Title Recognition Test, in asking children to identify known book titles, assessed print exposure. The last exercise, a free-writing one, gave children the opportunity to write about something of their own choice. Eighteen children from various schools in Warbrook who had been part of the earlier data gathering completed these tasks.

The correlations between the 1995 tasks and the 1990/1 tasks have been discussed in previous sections.

The Neale Analysis of Reading Ability

The rate of reading in the Neale Analysis (see Table 5.57) correlated significantly with both other aspects of the Neale (Accuracy and Comprehension) as might be expected. High correlations with both comprehensions are also evident with moderate correlations with the TRT and the Writing Task (see Table 5.57). Accuracy in the Neale Analysis correlates highly with Neale Analysis Comprehension and the two other Comprehension Tasks. The 1995 Writing Task shows a moderate correlation with Accuracy in the Neale Analysis. Neale Comprehension correlates significantly (a moderate relationship) with Comprehension One, the TRT and the 1995 Writing Task. A high correlation indicating a marked relationship is evident between Neale Comprehension and Comprehension Two.

As may be expected in two similar tasks, a very strong relationship is evident between Comprehensions One and Two. There is also a marked relationship between Comprehensions One and Two and the TRT. Thus print exposure is demonstrated as clearly related to comprehension skills in reading.

Table 5.57
Correlation Matrix: Neale Analysis, Comprehensions One and Two and the Title Recognition Test

Task	Neale R	Neale A	Neale C	Comp 1	Comp 2	TRT	FWT 6
Neale R	1						
Neale A	*.84*	1					
Neale C	*.64*	*.74*	1				
Comp 1	*.71*	*.79*	*.63*	1			
Comp 2	*.72*	*.84*	*.79*	*.90*	1		
TRT	*.67*	*.72*	*.47*	*.77*	*.73*	1	
FWT	*.50*	*.54*	*.69*	.32	*.52*	.46	1

Comprehension One and the TRT, however, do not relate significantly to writing skills as demonstrated by the 1995 Writing Task (see Table 5.57). Thus, print exposure and the comprehension skills tested in Comprehension One do not relate significantly to the 1995 Writing Task. Comprehension Two has a moderate relationship with the 1995 Writing Task.

These significant correlations between all aspects of the Neale Analysis of Reading Ability, a proven norm referenced reading test for Australian conditions, and the other 1995 tasks, add credibility to Comprehensions One and Two, the TRT and the Writing Task as valid ways of assessing children's literacy competence. Because these tasks cover extensive reading skills and print exposure and because the standardised test (Neale Analysis) also relates markedly or substantially to the other tasks, they may be assumed to be clear indicators of the children's literacy skills in middle childhood. The tasks support and validate one another and point to some degree to what may be identified as a "general literacy factor."

Neale Analysis results are shown as compared with chronological age in Table 5.58. Two children, Gail and Alex exceed their chronological age for rate of reading. However, whilst Gail's accuracy rate is good, her comprehension age is extremely low in comparison to both her other scores. Another two children, Toni and Katrina, are very close to their chronological age in rate of reading. Carl, Gail, Katrina and Lindsay may be said to be close to their chronological age in their reading accuracy. The rest of the group either does not register on the Neale scale or their scores lie well below age norms. In terms of comprehension scores only Carl and Katrina come anywhere near their chronological age.

Table 5.58

Neale Analysis: Individual Results

NB: numbers after the decimal points indicate number of months

Name	Chronological Age Yrs/months	Age for Rate of Reading	Age for Accuracy of Reading	Comprehension Age
Alex	9.8	10.3	8.8	9.0
Amelia	10.0	7.4	-	-
Aurora	9.11	8.4	7.4	7.5
Carl	10.4	9.4	10.2	9.8
Danielle	9.8	5.2	7.2	7.10
Debra	9.8	5.8	7.0	5.11
Gail	10.1	10.4	10.3	5.11
Graham	10.0	---	5.10	5.8
Gregory	9.11	8.10	9.1	9.0
Katrina	9.11	9.7	9.6	9.11
Kiagh	10.4	---	8.0	7.10
Korena	9.11	---	--	5.8
Lindsay	9.8	7.11	9.3	5.6
Luke	9.8	---	--	5.0
Patricia	9.10	---	--	5.0
Sally	10.3	5.1	7.0	5.11
Tanya	9.8	5.0	5.7	5.8
Toni	9.11	9.6	8.9	8.4

NB Blank spaces indicate that children's scores were too low to appear on the rating scales supplied in the Neale Analysis Handbook.

Five children read too slowly to appear on the reading rate scale and four children read too inaccurately to score highly enough to appear on the reading accuracy scale. Half of the children appear on the comprehension scale in the six year age group when their chronological ages fall in the nine/ten age groups. Of all the children, only Carl and Katrina may be said to be holding their own in terms of the reading skills tested by the Neale Analysis of Reading Ability. The other 16 children are well below norms in one or more of the three variables measured in the test.

Comprehensions One and Two

These two comprehension tasks have been used in similar research by Byrne et al. (1996a) with a larger group of similarly aged Non-Aboriginal children in a similar environment. In the present study, eleven children (of a total of 18) were unable to read Comprehension One well enough to complete any of the task questions (13 questions), supporting the Neale Analysis information that most children in this group were reading at levels well below most of their age group. Eight children had similar results in Comprehension Two (10 questions). The mean score for Comprehension One was 1.5 and for Comprehension Two, 4.3.

Whilst most children demonstrated some kind of grapho-phonic knowledge in both comprehensions through using a range of reading strategies such as 'sounding out', chunking, syllabification, self correction and prediction, twelve of the eighteen children were unable to use what skills they had effectively. For example, Graham could 'sound out' words but was unable to combine the sounds together in order to decode. There were many such examples. Only six children of the 18 were able to use their grapho-phonic knowledge effectively.

These results confirm the Neale Analysis results for Comprehension (see Table 5.58) This confirmation is also demonstrated in the correlations (see earlier). There were five questions in Comprehension Two which involved answers employing inference (Questions 1, 6, 7, 8, and 10). Half of the children scored zero on these five questions, the other half scoring between one and four.

The Title Recognition Test

Examination of the incidence of identification for the group (see Table 5.60) shows that no children appeared in a percentage group higher than 41% - 50% according to the formula used by Cunningham and Stanovich (1990).

Table 5.59

Title Recognition Test: Percent Identified and False Alarm Rates on Foils

	% Identified
Fantastic Mr Fox:	25.0
The Black Stallion:	17.5
Goggle Eyes:	5.0
Why the Whales Came:	15.0
Animalia:	10.0
Charlotte's Web:	32.5
Wind in the Willows:	20.0
Shoes from Grandpa:	25.0
A Lamb Like Alice:	7.5
The Paw Thing:	22.5
There's a Sea in My Bedroom:	32.5
Alice in Wonderland:	35.0
Danny's Egg:	15.0
Halfway across the Galaxy & Turn Left:	15.0
George's Marvellous Medicine:	27.5
Princess Smartypants:	15.0
The Adventures of the Wishing Chair:	15.0
Spaghetti Legs:	5.0
The Paper Bag Princess:	17.5
The Enormous Crocodile:	15.0
Anna's Ghost:	12.5
Where the Wild Things Are:	10.0
Melissa's Ghost:	15.0
The Eleventh Hour:	12.5
Foils	**False Alarm Rate (%)**
Unkind:	7.5
It's My Room:	17.5
The Bugalugs Bum Thief:	5.0
Swim for Your Life:	10.0
Hot Top:	12.5
Don't Go Away:	10.0
The Missing Letter:	22.5
Sadie Goes to Hollywood:	10.0
The Hideaway:	10.0
The Rollaway:	2.5
Skateboard:	10.0
Ethan Allen:	2.5
He's Your Little Brother!:	12.5
The Schoolhouse:	15.0
The Lost Shoe:	15.0

Table 5.59 shows percentages of identified titles and the false alarm rate on foils expressed as a percentage. Comparisons with the results of Cunningham and Stanovich's (1990) similar study in Michigan and California show clearly that recognition rates in this group of children were not nearly as high as in the US studies. Comparison with Australian studies by Byrne et al. (1996a) reveal similar results. Thus the Title Recognition Test also supports the Neale Analysis of Reading Ability's findings in that

children are deemed to have a more limited print exposure than the norm for Australian conditions.

Table 5.60
Title Recognition Test: Incidence of Identification with Scores Expressed as Percentages

Score	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Number Children	3	4	5	3	3	0	0	0	0	0

Table 5.61
Free-Writing Task 1995: Children in Writing Development Stages

Phase	2	2/3	3	3/4	4	5	6
No of Chn	2	4	7	4	1	0	0

The Free-Writing Task

In the Free-Writing Task children were assessed by locating them on the Writing Developmental Continuum of Raison and Rivalland (1994) (see Appendix 3.1). Table 5.61 shows how many children fall into each phase. There are no children in Phases Five or Six (Proficient Writing & Advanced Writing) and one child in Phase Four (Conventional Writing). Four children are in the process of progressing from Early Writing (Phase Three) to Conventional Writing. Seven children, the largest subgroup are clearly in the Early Writing Phase (Three) of the Developmental Continuum. There are four children progressing from Phase Two (Experimental Writing) to Phase Three and two children in the Experimental Writing Phase. Seventeen of the eighteen children who completed this task fall into Phase Three or below.

Summary/Conclusion

A number of Kindergarten tasks appear to be able to predict performance four or more years later. At the end of the Kindergarten year (S5), the third phase (decontextualised reading) of the Environmental Print Task, the Sand/Concepts about Print Task, the letter Identification Task and the Reading Task all correlated significantly with the 1995 tasks (excluding the Free-Writing Task). Over the four year period the children's performance could thus be seen as relatively stable.

The relatively enduring relationships between some Kindergarten tasks and literacy tasks in middle primary school give rise to further speculation concerning a "general

literacy factor" (mentioned briefly earlier) which may consist of interactions between various literacy-related skills and competencies the children have developed by the end of their Kindergarten year.

It is clear from the performances of the children over a long period of time that literacy knowledge is relatively low in comparison with other similarly aged groups in Australia, the US and New Zealand. This is firmly supported by performance in the Sand/Concepts about Print Test, by the Title Recognition Test in later childhood and by earlier discussion in Chapter 2.

Such are the conclusions of an analysis of the performance of these children in group terms. Further light may be shed on these conclusions by considering the performance of a number of individual children who may be said to provide more detailed evidence of the chains of causation and complex interactions involved. Such evidence is discussed in Chapter 6.