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Marion Meiers
ACER, Marion.Meiers@acer.edu.au

Margaret Forster
ACER, Forster@acer.edu.au

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THE ACER LONGITUDINAL LITERACY AND NUMERACY STUDY (LLANS)

Marion Meiers
Margaret Forster

Australian Council for Educational Research

Paper presented at the ACER Research Conference 'Improving Literacy Learning—What does research tell us?' Adelaide 18-19 October 1999

The Longitudinal Literacy and Numeracy Study
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PART I: CONTEXT AND BACKGROUND FOR AN AUSTRALIAN LONGITUDINAL LITERACY AND NUMERACY STUDY

ESTABLISHING THE STUDY

Introduction

This paper is structured in three parts. The first part outlines the background to the study, the general methodology, and the scope and nature of the data to be collected. We then move to an oral vignette from Veronica Luck, an early years teacher who will give a teacher's perspective on this first year of the study. Thirdly, Margaret Forster describes the process by which achievement data will be reported.

Some reference is made to the work on numeracy in the study, but the focus of this paper is on literacy.

The work discussed in this paper represents the collaborative efforts of many people at ACER, as well as the significant contribution to the project which has come from the teachers in the schools participating in the study. Teachers are definitely partners in this research, and for that reason, it is good to have one of the teachers as a co-presenter of this paper.

As project director, I wish to acknowledge the work of a number of ACER staff:

Wendy Bodey, Lynne Darkin, Eve Recht, Prue Anderson, Margaret Forster, Geoff Masters, Andrew Stephanou, John Barnard, and Silvia McCormack.

The work of teachers in nearly 100 Australian schools is also acknowledged.

This ACER national study has been designed to follow the literacy and numeracy development of a national sample of students throughout the years of primary schooling. The study commenced this year with children at the beginning of their school lives.

The study is an Australian Council for Educational Research initiative, funded from the core grant of the ACER.

As a seven-year longitudinal study, the project will generate important insights into patterns of development in literacy and numeracy. Other studies of literacy and numeracy learning in Australia have tended to be cross-sectional rather than longitudinal. The 1996 National School English Literacy Survey, and State and Territory assessment programs, for example, provide detailed information about the achievements of particular cohorts of students, whereas this study will collect data on growth over an extended period of time.

Background

The 1996 National School English Literacy Survey (NSELS) provided a comprehensive mapping of literacy achievement in reading, viewing, writing, speaking, and listening for students in Year 3 and Year 5. The data from the NSELS was reported on a series of scales. A national longitudinal study creates an opportunity to extend the achievement scales developed from the NSELS data, from the early years through to the middle years of schooling, and the transition to secondary school.

The Longitudinal Literacy and Numeracy Study

Ms Marion Meiers, Ms Margaret Forste, Mrs Veronica Luck

The National Literacy and Numeracy Plan, agreed to by Commonwealth, State and Territory Education Ministers in March 1997, emphasises the importance of developing strong foundational literacy and numeracy skills for all Australian children. The goal contained within the Plan, *That every child leaving primary school should be numerate, and be able to read, write and spell at an appropriate level*, focuses attention on the primary school years as a whole. The related sub-goal, *That every child commencing school from 1998 will achieve a minimum acceptable literacy and numeracy standard within four years*, focuses more closely on the crucial early years of schooling. The longitudinal study will report on comprehensive explorations of growth in those early years, and will then continue the investigation throughout primary schooling.

Elements of the National Plan, such as the assessment of all students by their teachers as early as possible in the first years of schooling, and the development of agreed benchmarks in literacy and numeracy for Year 3 and Year 5, have created a context in which it is essential to understand more about the patterns and sequences of growth in literacy and numeracy. A longitudinal study provides a significant means of developing such understandings.

The Children's Literacy Research Project, *100 Children Go to School* (1998, Hill, S et al, DEETYA) explored in depth the connections between literacy development prior to school and in the first year of formal schooling. The LLANS study will complement this work, and the longitudinal study which is continuing the work of *100 Children go to School*. The LLANS will build up a broad picture of both literacy and numeracy development from 1000 Australian children, form the first year of formal schooling.

Purposes of the Study

The primary purpose of the study is to address the key research question: 'What is the nature of literacy and numeracy development amongst Australian school children?'

The project has been designed to:

- identify and describe typical development of skills in reading, writing, speaking and listening, and viewing;
- identify and describe typical development of skills in number, measurement, space, chance and data;
- investigate and describe background variables which may influence children's development in literacy and numeracy throughout the years of primary schooling, taking account of their experiences before school entry, and outside school;
- link data on students' achievements in literacy with the achievement data from the National School English Literacy Survey;
- explore the relationships between literacy and numeracy development; and
- investigate teaching approaches in literacy and numeracy, in a special targeted sample.

The National Sample

The national sample of 1000 students was selected from an Australia-wide sample of 100 schools. These schools were selected by two processes: 80 schools were randomly selected from the ACER sampling frame, and a balanced selection of a further 20 schools was made from schools nominated by education authorities because of particular characteristics of their programs. A case study approach will be used for schools in this targeted sample to investigate a range of literacy and numeracy teaching programs.

Ten students were randomly selected from class lists provided at the beginning of the 1999 school year by the 100 schools in the project, and the approval of the parents of these children was obtained. This has created a total sample of 1000 students. As far as possible, students who change schools in Australia will remain in the study. Already, some students have moved to other schools, and where possible, we have negotiated their continuation in the study with the principal of the new school.

The Methodology

Comprehensive data on the literacy and numeracy growth of the participating students will be collected each year, from common tasks developed at ACER, and from work samples selected from the students' normal classroom work. A range of background data on school, teachers and student variables will also be collected annually from a set of questionnaires. This will enable analyses to be made in relation to age, gender, ESL learners, language background other than English, time spent reading, watching television and using computers at home and so on.

An important aspect of the methodology is the role of teachers as partners in the study. In this first year of the study, the students' own teachers have administered and recorded students' responses to the common tasks, and selected the work samples. In the first years of the study, the assessment tasks will need to be undertaken in one-to-one situations with individual students. ACER has provided all the materials, a detailed guide to teachers, and record sheets.

Later in the study, in years 3 and 5, the Development Assessment Resource for Teachers (DART) tasks in reading, writing, speaking, listening and viewing will be used, linking the study with the NSELS.

Portfolios are being used to collect samples of students' normal classroom work, including writing and numeracy work. The first portfolio samples provide a vivid picture of the range of achievement in writing, in the first few weeks at school. At the completion of the whole study, the collected work of seven years in the portfolios will provide a rich picture of each child's development.

The first set of common tasks was designed to capture information about what students know and can do in literacy and numeracy when they enter school. This baseline data for the whole study was collected in the first weeks of the 1999 school year.

Common Assessment Tasks

Developing valid and reliable common assessment tasks for school beginners has been a complex process. An extensive review of school entry and baseline assessments was undertaken, and the DEETYA project, *Assessment of Literacy and Numeracy in the Early Years of Schooling*, undertaken in 1998 by Curriculum Corporation provided a most useful data base. Work by Clay, Wolfendale, and Blatchford and Cline further informed this review. Progress maps relevant to the early years, such as the *Early Years Literacy Profile* (DECS, SA, 1996), and *First Steps* helped to identify the range of skills and knowledge which might be investigated through the common tasks. The US report, *Preventing Reading Difficulties in Young Children*, (Snow, C, Burns, S and Griffin, p, 1998) highlights the significance of attention in all primary classrooms to *the full array of early reading accomplishments: the alphabetic principle, reading sight words, reading words by mapping speech sounds to parts*

of words, achieving fluency, and comprehension. (p 6) This helped in the identification of significant aspects of emerging literacy.

These reviews helped to ensure the validity of the tasks, in that they would address an appropriate understanding of early literacy development. Further considerations relating to the validity of the tasks included the development of meaningful tasks, appropriate for different sub-groups of students, and the involvement of teachers in making judgments about students' responses.

The item writers have designed tasks to be administered by teachers working one-to-one with students. Each set of instructions has been carefully worded to make what is required absolutely clear to both teacher and student, thus ensuring the reliability of the assessments. For example, in the activities relating to book orientation and directionality of text the directions allow the child to explore the provided text, but also take account of the need for the teacher to be able to record the child's responses clearly and quickly. Questions such as 'Where does the story begin? Where do I go now? I'm going to start reading the story on this page. Show me where to begin', are designed to provide insights into how much the child knows about books.

In designing the common tasks it was also important to take account of time, acknowledging the practicalities of managing one-to-one assessments in the classroom. Therefore, the focus was on essential aspects of emerging literacy and numeracy. For literacy, the assessment activities covered five aspects: environmental print, phonemic awareness, book orientation, retelling, and concepts of print. Numeracy activities included tasks on patterns, shapes and counting.

Emphasis has been placed on using everyday materials as the basis for the assessment activities. A set of photos of print on objects and places in the everyday environment, including cereal packets, and service stations provided the basis for one task, drawing from the very interesting environmental print tasks developed for *100 Children go to School*. A picture storybook was used to explore the children's knowledge of print conventions, and for a retelling activity. In the set of tasks children will undertake in November 1999, after several months at school, another picture story book will be used, as well as a reader selected for its appropriateness to the level at which many students will be beginning to read.

Pop sticks, counters, and coloured shapes were used in hands-on numeracy activities designed to investigate what the children know about aspects of numeracy such as patterns, shapes, and counting.

The fist set of tasks was trial tested in both school and pre-school centres, and the data from these trials was used to refine the task, to ensure the validity and reliability of the tasks. Similar processes of trial testing will be followed for all sets of common tasks to be used in the study.

The literacy assessment tasks completed by the students in the first few weeks of school were based around the following five key areas:

Activity 1	Environmental print
Activity 2	Phonemic awareness
Activity 3	Book orientation
Activity 4	Retell
Activity 5	Concepts of print

The numeracy assessment tasks completed by the students in the first few weeks of school were based around the following six key activities:

A Over and under
B Patterns
C Birthdays
D Shapes
E Counting
F Carl's Cafe

An example of a literacy task

As the assessment tasks have been designed to be administered under standard conditions, in order to maximise reliability the assessment booklets contain:

- instructions for teachers (in italics);
- the text of what the teachers says to the student (in bold); and
- clear, simple marking guides.

The following connected series of small tasks was designed to assess aspects of book orientation and directionality of text:

1. Pick up the book and have a look at it.

2. Now show me the front of the book

3. Look at the story in the book.
Can you read me some of the story?

4. The name of this book is Precious Eggs.
Can you show me where it says Precious Eggs?

5. Where does the story begin?
Where do I go now?

6. I'm going to start reading the story on this page.
Show me where to begin.

7. Show me which way to go.

8. Where do I go after that?
Now I'll read the story to you.

The marking guide enables the teacher to make a judgement and directly record the child's response. For example, for Activity 4 (see above) the marking guide identifies the following possible responses:

Identifies title
Identifies author or illustrator information
Other answers (includes pointing to both of above)
No attempt.

Portfolio samples

The Longitudinal Literacy and Numeracy Study

Ms Marion Meiers, Ms Margaret Forste, Mrs Veronica Luck

Another set of interesting data is being built up from samples of children's normal classroom work in literacy and numeracy which teachers select and send to ACER. Two sets have been collected this year, the first from the children's work in February and March, and the second set from August and September. These samples will be collected into literacy and numeracy portfolios for each child in the study. A panel of Victorian early years teachers involved in LLANS has been convened to assess these portfolio samples, extending the direct involvement of teachers in the study.

A preliminary scan of the writing samples from the students' normal classroom work in the first term indicates the very wide range of what students can do with writing at the beginning of school, including scribble; strings of carefully formed individual letters; and well-structured sentences, using approximated spelling, such as "wen" for "when" and "holodas" for "holidays". A marking guide has been developed for assessing these samples.

Vignette: A Teacher's Perspective

--oral presentation by Virginia Luck

PART II: REPORTING LITERACY ACHIEVEMENT DATA FOR THE LONGITUDINAL LITERACY AND NUMERACY STUDY (LLANS)
WORK IN PROGRESS

The analysis and reporting of LLANS school-entry data will draw on the conceptual work of a number of people, in particular Wendy Bodey and Eve Recht who designed the tasks which provide the evidence of student achievement, and Andrew Stephanou who is responsible for guiding the data analysis.

During the life of the study, we will investigate and report data from a variety of different perspectives to provide the most informative picture possible of literacy and numeracy growth—although it is literacy growth that we are focusing on in this paper.

A basis for analysis and reporting

The fundamental step in analysing and reporting LLANS literacy data is to construct a literacy, or set of literacy, scales. Once a scale is constructed, it is possible to

- describe and illustrate achievement along the scale;
- compare and report subgroup performances on the scale;
- investigate teacher/school and student characteristics correlated with literacy achievement; perhaps
- interpret literacy achievement in terms of levels of state and territory outcomes and/or national benchmarks; and
- show growth over time.

The long-term intention of the study is to construct a series of literacy scales against which to report literacy growth across the years of primary school.

Some of this work has been completed already through the National School English Literacy Survey (NSELS). In NSELS we developed reading, writing, spelling, viewing, speaking and listening scales against which to report the literacy achievements of students in Years 3 and 5. Through the LLANS work, we hope to extend these scales down to school entry in order to develop a more complete picture of literacy growth.

This section of the paper focuses on work in progress to construct the beginnings of the literacy scale from evidence of student achievement collected when students first enter school, that is in the first half of the first year of the LLANS study. The paper discusses the methodology we use to describe and illustrate achievement on that scale.

An empirically based continuum of growth

The literacy scale under development is empirically based. That is, it is based on a measure of each participating student's achievement. Each student's responses to LLANS tasks are used to construct the scale so that the location of literacy skills along the scale is based on students' observed performances on the literacy tasks. The method used to construct the scale allows achievement measures to be interpreted in terms of the skills typical of students at various levels of achievement.

The scale represents a continuum of achievement and provides a picture of typical literacy growth.

Step 1: calibrating the literacy tasks

The first step in the construction of the literacy scale is to calibrate the complete set of literacy tasks together. The initial calibration of all the school entry literacy tasks is shown in Figure 1.

The Figure 1 map shows the literacy tasks calibrated on the same scale as student ability. The tasks are ordered from the easiest task at the bottom (CP13.1) to the most difficult task at the top (EP10.4). The Xs on the left illustrate numbers of students at particular levels of ability.

Students at the level of ability, shown by the arrow would be likely to answer correctly the tasks below this level of the map. They would be unlikely to answer the tasks above the level of the arrow correctly.

Step 2: investigating 'fit'
The second step in the construction of the literacy scale is to investigate the 'fit' of items. That is, the degree to which the items work together to define the dimension being described. The model we use in developing our scales begins with the intention to focus on just one aspect of growth at a time. Do the tasks work together to support the concept of a progression of learning against which achievement can be reported?

We investigate the fit of items using displays of the kind shown in Figure 2. To be consistent with our model, we expect item fit values (asterisks) to be located in the boxed region. The values on the far right indicate tasks which have relatively low correlations with this literacy dimension. The values on the left indicate tasks which have unusually high correlations with this literacy dimension. Items which fall outside the boxed region (circled) are analysed carefully and a decision made whether or not to include the evidence from these tasks in the scale under construction.

Step 3: Describing growth
The third step is to describe growth along the scale based on the evidence provided by the tasks. To make the work more manageable we look first at the tasks grouped by Activity. Figure 3 shows the item calibrations for Literacy Activity 5 'Concepts of Print'.

What can we learn about students' growth in understanding concepts of print from this map of items? Against which understandings will we be able to report student achievement?

The Longitudinal Literacy and Numeracy Study

Ms Marion Meiers, Ms Margaret Forste, Mrs Veronica Luck

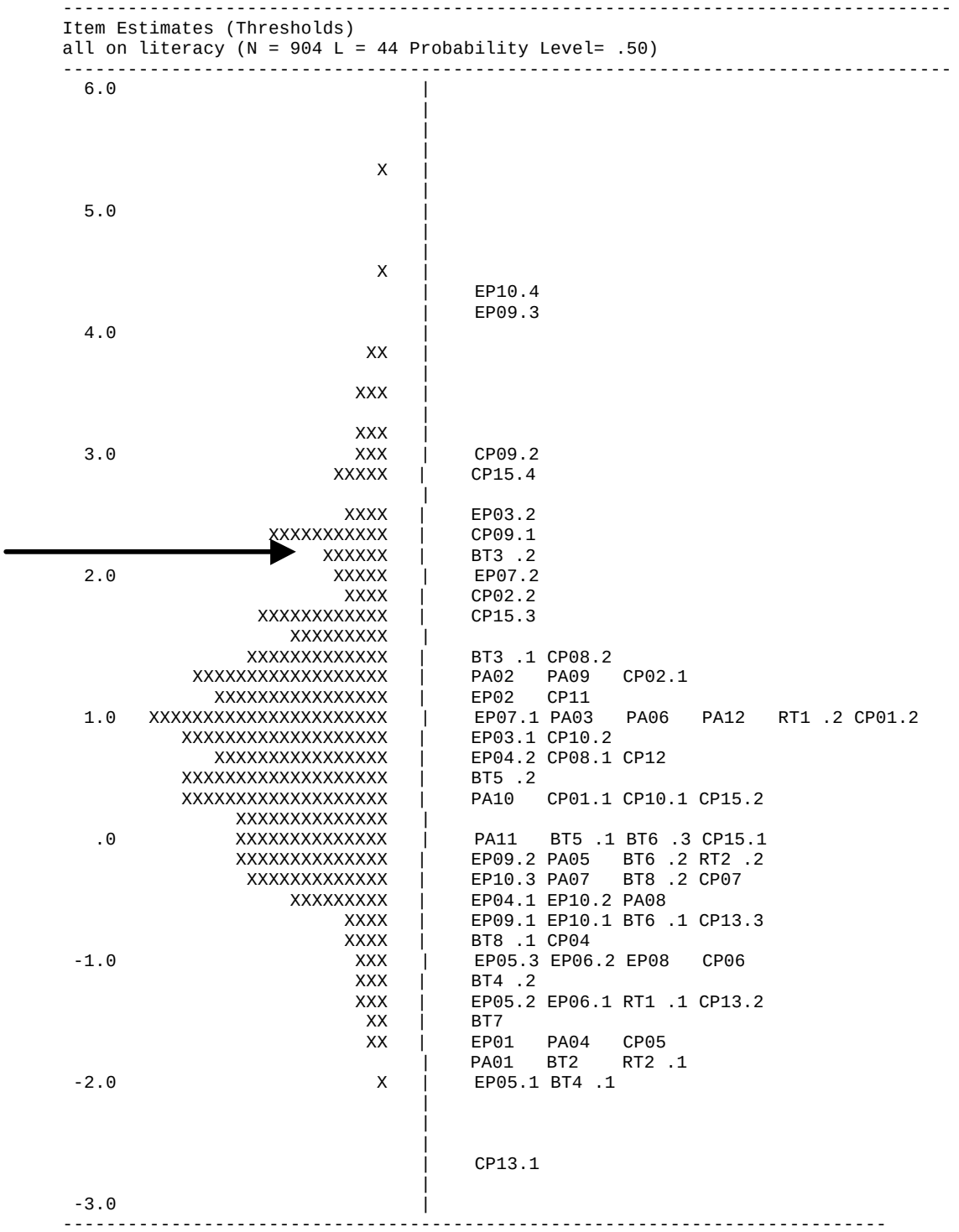

Figure 1 Calibrated School Entry Literacy Tasks

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Ms Marion Meiers, Ms Margaret Forste, Mrs Veronica Luck

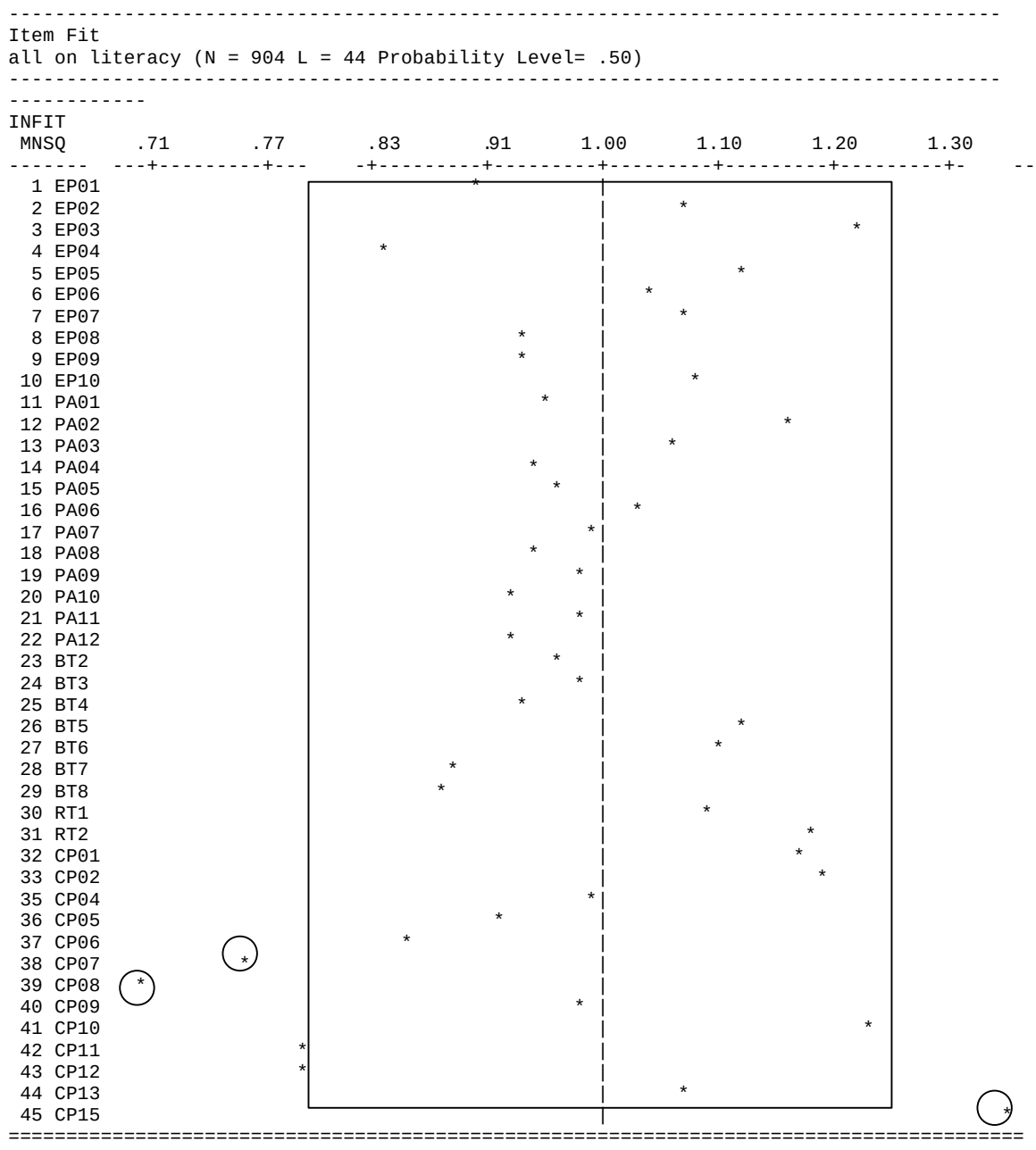

Figure 2 Investigating item 'fit'

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------------------------------------------------------------------------------
Item Estimates (Thresholds)

all on concprint (N = 904 L = 13 Probability Level= .50)
------------------------------------------------------------------------------
-----------
  4.0                             |
                                  |
                       XXXXXXXX   |
                                  |
                                  |
                                  |
                        XXXXXXX   |    CP09.2
  3.0                             |
                                  |    CP15.4
                  XXXXXXXXXXXX    |
                                  |
                                  |    CP09.1
                XXXXXXXXXXXXX     |
                                  |
  2.0       XXXXXXXXXXXXXXXXXX    |
                                  |    CP02.2
                  XXXXXXXXXXXX    |    CP15.3
                XXXXXXXXXXXXX     |    CP08.2
                             X    |
             XXXXXXXXXXXXXXXXX    |    CP02.1
           XXXXXXXXXXXXXXXXXXX    |
  1.0                             |    CP01.2 CP11
          XXXXXXXXXXXXXXXXXXX     |    CP10.2
        XXXXXXXXXXXXXXXXXXXXX     |    CP08.1
                            X     |    CP12
       XXXXXXXXXXXXXXXXXXXXXX     |    CP10.1
           XXXXXXXXXXXXXXXXXX     |    CP01.1 CP15.2
   .0         XXXXXXXXXXXXXXX     |    CP15.1
                            X     |
             XXXXXXXXXXXXXXXX     |
                                  |    CP07
               XXXXXXXXXXXXXX     |
                  XXXXXXXXXXX     |    CP13.3
                                  |
 -1.0             XXXXXXXXXXXX    |    CP04   CP06
                                  |
                                  |
                         XXXXX    |    CP13.2
                                  |
                                  |    CP05
                         XXXXX    |
 -2.0                             |
                                  |
                           XX     |
                            X     |
                                  |
                                  |    CP13.1
                                  |
 -3.0                             |
                            X     |
                                  |
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                                  |
                                  |
                                  |
 -4.0                             |
------------------------------------------------------------------------------
  Each X represents  3 students
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Figure 3 Item calibrations for Literacy Activity 5 'Concepts of Print'

We begin describing growth by describing the knowledge, skill and understanding addressed by each task. What are the skills that students demonstrate when completing a task correctly. For example, the easiest task in the set is CP13.1. The teacher says to the student, 'Write your name on the page.' To score 1 on this task students need to produce a gesture at writing: scribble. The most difficult task of the set is CPO9.2. In this task, the teacher points to the word 'shade' and says to the student, 'Can you read this word?' To answer this item correctly students need to be able to read the word 'shade' without error.

In this way, we look at each task in turn describing what it is the student needs to be know and be able to do. Figure 4 shows the 'descriptors' for each of the tasks in the 'Concepts of Print' Activity.

Reads the word 'shade' correctly.	CPO9.2
Writes a recognisable sentence about a picture.	CP15.4
Makes a good attempt at reading the word 'shade' (eg reads 'sh').	CPO9.1
Identifies a question mark and knows its purpose.	CPO2.2
Writes a recognisable word in a sentence about a picture.	CP15.3
Names all letters in the word 'shade'.	CPO8.2
Identifies a question mark.	CPO2.1
Recognises a full stop and knows its purpose.	CPO1.2
Recognises a matching lower case letter when shown a capital N.	CP11
Identifies a capital letter.	CP10.2
Names some letters in the word 'shade'.	CPO8.1
Recognises a matching lower case letter when shown a capital T.	CP12
Identifies a full stop.	CPO1.1
Identifies another capital letter when shown a capital letter.	CP10.1
Writes recognisable letters in a sentence about a picture.	CP15.2
Writes scribble in a sentence about a picture.	CP15.1
Identifies the last letter in the word 'shade'.	CPO7
Writes own name correctly.	CP13.3
Identifies a word.	CPO4
Identifies the first letter in the word 'shade'.	CPO6
Makes a good attempt at writing own name correctly.	CP13.2
Identifies a letter.	CPO5
Scribbles for own name.	CP13.1

Figure 4 Descriptors for 'Concepts of Print' Activity

Step 4 Refining our understanding of 'Concepts of Print'

The fourth step in the process is to refine our understanding of growth along the scale. We approach this step in a number of ways. Three examples are discussed.

Example 1: look for 'like' tasks

We look for tasks which address similar understandings. For example, four tasks address understanding of punctuation: CPO1.1, CPO1.2, CPO2.1 and CPO2.2 (see Figure 4). These tasks calibrate towards the upper half of the scale, with the items addressing recognition and use of question marks (CPO2.1 and CPO2.2) clustering together at a higher level than those addressing full stops (see Figure 3). We may want to generalise this discovery in our final scale descriptions.

Example 2: look for items demanding increasing skill and understanding
Four tasks relate to 'reading' the word 'shade' (CPO6, CPO7, CPO8, and CPO9 (see Figure 4). Pointing to the word 'shade', the teacher asks: Show me the first letter in the word. Show me the last letter in the word. Can you tell me the letters in this word? Can you read this word?

Looking at these items as a set helps us to understand growth along the scale and also to isolate areas along the scale where we might want to look more closely. For example, the area along the scale where student move from reading elements of a word to reading the whole word is probably of particular interest.

Example 3: look for tasks which cluster along the scale
Two tasks cluster at the top of the scale: CP15.4 and CPO9.2 (see Figure 3). To complete task CPO9.2 students need to read the word 'shade'. To complete task CP15.4, they need to write a recognisable sentence under a picture. The tasks differ from tasks that calibrate lower on the scale in that they demand more sophisticated reading and writing skills.

Looking at these items as a set again highlights an area of the scale where we might want to look more closely.

Step 5: Putting the pieces together

When work is completed for each of the five Activities we put the pieces together to develop a complete picture of growth—a described scale against which to report achievement.

An example of completed work of the kind we are envisaging for LLANS is the NSELS literacy scales. Figure 5 shows one of the NSELS writing scales against which we reported Year level and subgroup achievement. Figure 6 summarises the distributions of writing measures on this scale as 'box and whisker' plots which indicate levels on the writing scale achieved by 10%, 20%, 50%, 80% and 90% of males and females at Year 3 and Year 5.

We posed a difficult question at the beginning of the study: 'What is the nature of literacy and numeracy development amongst Australian school children?' The challenge is to answer the question in a way that not only helps us better understand growth but also in a way that provides research evidence which will assist teachers to improve learning.

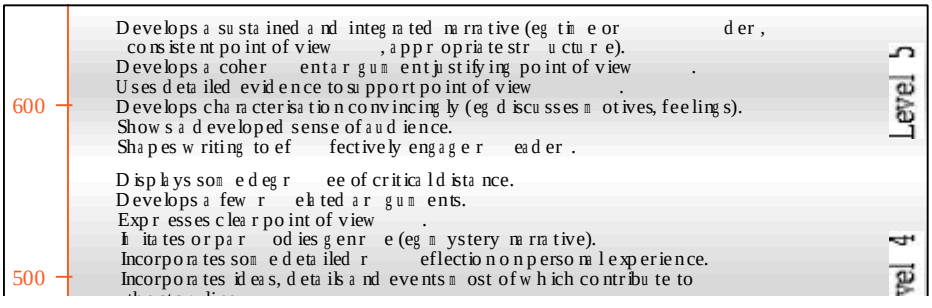

Figure 5 The NSELS writing scale—content

The Longitudinal Literacy and Numeracy Study

Ms Marion Meiers, Ms Margaret Forste, Mrs Veronica Luck

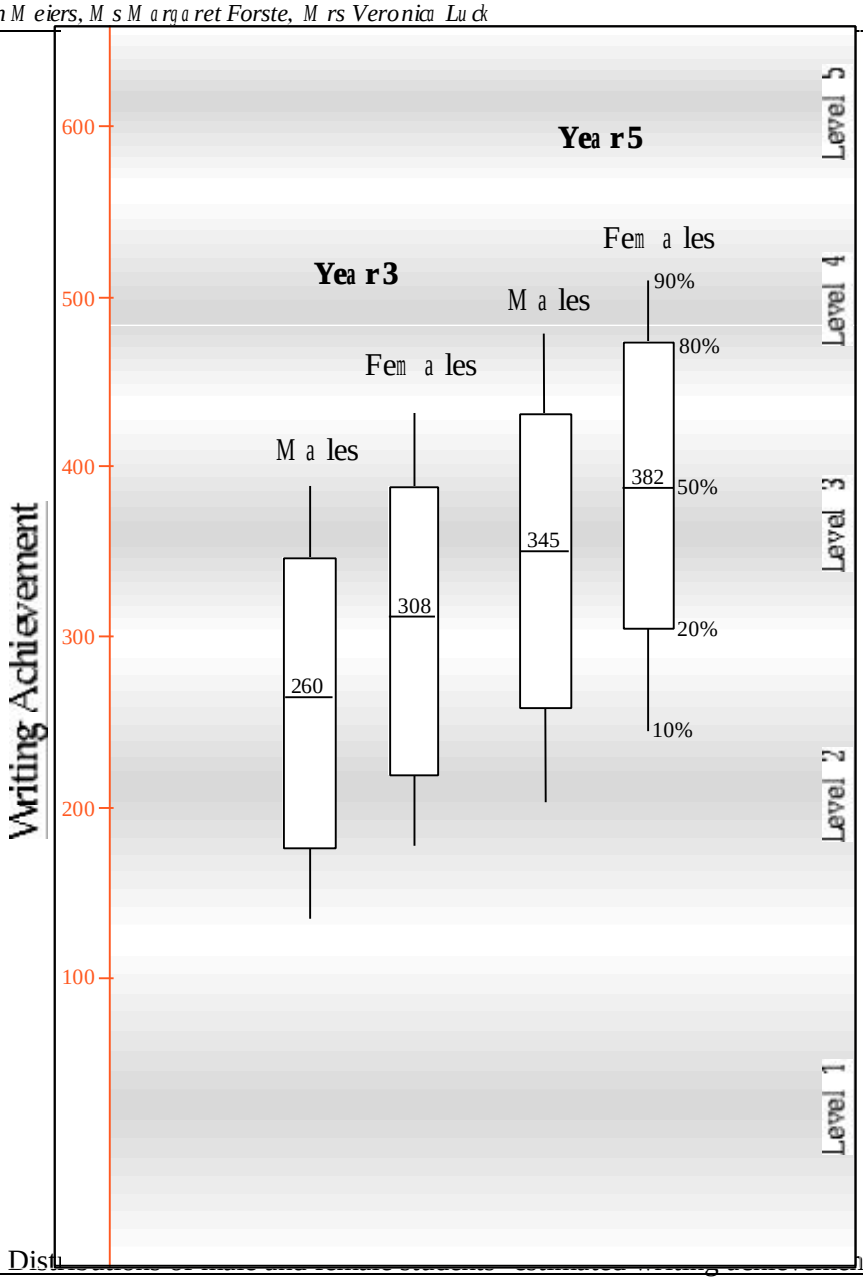

Figure 6 Distu[illegible]ts

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