What Children Know And Can Do When They Start School And How This Varies Between Countries

Abstract

This large-scale study describes what children know and can do when they start school in Scotland. The description became possible because a third of Scottish Authorities are involved in a single, broadly based, on-entry baseline assessment of children. The study also looked at variations by home background, sex, age and pre-school experience within Scotland. Comparisons were then made with the cognitive development of children starting school in England, New Zealand and Western Australia, concentrating on children whose first language was English. Surprising differences were found between Scotland and other countries. New Zealand also stood out on some measures. The results are discussed in terms of pre-school provision and what on-entry assessment can and cannot tell us.

Keywords: baseline assessment, Scotland, pre-school, international comparisons

Introduction

Children typically start school in Scotland when they are aged 5 years although this will vary by up to 6 months. Although pre-school experience is not a statutory requirement, most children will have attended nursery and/or playgroup, and this will be for different durations depending on local policy and parental choice. Scotland has a curriculum framework for children aged 3 – 5 years (Scottish Executive, 2001) and then from the start of formal school, teachers work within the 5 – 14 guidelines (Scottish Executive, 2000). There is currently considerable interest in early years education within Scotland, reflected by the Scottish Executive's action to commission a review of international perspectives on early years education (Stephens, 2006), and the analysis in this paper contributes to the debate by looking at the cognitive development of children starting school in Scotland in the specific areas of vocabulary acquisition, phonological awareness, early reading and early mathematics. Rasch measurement is used to create equal interval scales from which direct comparisons between areas of development can be made. This method of analysis provides a model, which can be applied to the development of children in other countries. Children's cognitive development is also analysed in relation to age, sex, social background, special needs and first language.

The developmental profile of children starting school in Scotland is then compared with children in three other English-speaking countries: England, New Zealand and Western Australia. A good number of international studies, for example TIMSS, PISA and PIRLS, have looked at the attainment levels of pupils after several years of schooling but without a common baseline measure of children at the start of formal schooling these studies cannot compare the educational progress across countries. A common assessment on entry to formal schooling also provides a basis for a comparison of the pre-school policies and programmes of different countries. In a recently published longitudinal study, Van de Rijt et al. (2003) did use a common assessment at three time-points to compare the early numeracy development of young children in different European countries. Children were aged five and six years at the time of the first assessment, the second assessment was conducted half way through the year and the final assessment was administered one year after the first when the

children were, aged six and seven. Almost 1,900 children from Germany, Belgium, Greece, The Netherlands, United Kingdom and Slovenia participated. This gave approximately 300 children per country. A single assessment that covered the broad aspects of early numeracy was translated for use in the different countries and administered to children on an individual basis. Van de Rijt et al. were able to report the attainment and progress of children over one full year during which some children were in full-time education and others did not attend school at all. They concluded that the assessment was appropriate for making international comparisons. Their results indicated that differences in the numeracy development of the children in the participating countries were small, which was surprising given the variation between countries in early education policy, and they suggested that further qualitative work was necessary to be able to interpret the data fully. There might also be an issue with the representativeness of each sample to the country as a whole although the authors did describe the sampling procedure for each country.

The analysis in this paper, which compares the starting points of children in four English-speaking countries, adds weight to the possibility of a more broadly based international study of children starting school, extending the potential of the current international studies. It also builds upon other recently published work (Tymms, Merrell and Jones, 2004, Tymms and Merrell, 2004, Van de Rijt et al. 2003), by using larger sample sizes.

Measures

The PIPS On-entry Baseline Assessment is one of several projects run from the Curriculum, Evaluation and Management (CEM) Centre at Durham University (CEM Centre, 2005, Fitz-Gibbon, 1996, Tymms, 1999a, Tymms and Coe, 2003), which aim to provide schools with data on the attainment, progress and attitudes of their pupils. The CEM Centre provides assessments and monitoring systems for children aged 3 – 18 years. Schools (and sometimes whole education authorities) subscribe to the projects. The CEM Centre provides the necessary assessments and then marks and analyses the data for schools, and provides them with standardised feedback on the attainment, attitudes and progress of their pupils. As a result of the service, the CEM Centre holds large longitudinal datasets that can be further analysed for research purposes such as this paper. One particular assessment, the PIPS On-entry Baseline Assessment (PIPS-BLA) is administered within the first six weeks of a child starting compulsory education. The assessment, which is computer-delivered, is administered individually and the whole procedure takes approximately 20 minutes per child. It is used in several countries around the world[1] with translations and cultural adaptations being made where necessary. Children start school at different ages in different countries and an explanation of how this is controlled for will be provided in later sections.

The content of the PIPS-BLA is based on those factors which previous research has shown to be the best predictors of later success or difficulty at school (for a review of the relevant literature, see Tymms and Middleton, 1995 and Tymms 1999b). These reflect the general developmental level of a child rather than the outcome of any specific curriculum, which is important for an assessment given at the start of school. The style of presentation of the assessment has been designed to be attractive and appealing to children, and teachers have repeatedly reported that children find the experience of completing the PIPS-BLA an enjoyable one.

The following areas are assessed:

- Writing – the child is asked to write his/her own name and the quality of writing is scored against examples.

[1] England, Germany, Hong Kong, New Zealand, Scotland, Slovenia, South Africa, The Netherlands, Wales, Western Australia.

- Vocabulary – the child is asked to identify objects embedded within a picture.
- Ideas about reading – assesses concepts about print.
- Repeating Words – the child hears a word and is asked to repeat it in this assessment of phonological awareness.
- Rhyming Words – the child selects a word to rhyme with a target word from a choice of three options in this assessment of phonological awareness.
- Letter identification – a fixed order of mixed upper and lower case letters.
- Word recognition and reading. This starts with word recognition and moves on to simple sentences that the child is asked to read aloud. The words within these sentences are high frequency and common to most reading schemes. This is followed by a more difficult comprehension exercise which requires the child to read a passage and at certain points select one word from a choice of three that best fits that position in the sentence.
- Ideas about mathematics – assessment of understanding of the vocabulary associated with mathematical concepts.
- Counting and Numerosity – the child is asked to count four objects. These disappear from the screen and then the child is asked how many objects they saw. This is repeated with seven objects.
- Sums – addition and subtraction problems presented without symbols.
- Shape identification.
- Digit identification – single, two-digits and three-digits.
- Maths problems – including sums with symbols.

The computer program presents the child with questions (aurally) and depending on the nature of the question, the child responds either by pointing to the answer from the choice of options on the screen or by saying the answer. The teacher controls the pace of the assessment and records the child's response on-screen. The program selects the next appropriate question. The way that the assessment works is illustrated by referring to the section relating to vocabulary. In this section a child is

shown a scene and asked to point to an item in that scene. The first scene is of a kitchen and for the first item the child is asked to identify the 'carrots'. The program continues with further, progressively more difficult, vocabulary items until finally it becomes too difficult for the child. At that point the program moves onto the next section. Each section operates independently using a bank of items, which are presented to the child in an order of increasing difficulty. It follows a pre-determined 'stopping rule' sequence. When a child gets three consecutive items wrong or four wrong altogether in a section, the program moves straight on to the next section.

The PIPS-BLA is extremely reliable. In England, the overall test-retest reliability (excluding phonological awareness) is 0.98. This high test-retest reliability has been found in other countries too (see for example, Van der Hoeven-van Doornum, 2005). The test-retest reliability of the phonological awareness section was somewhat lower at 0.63. The internal reliabilities for the subscales analysed in this report are as follows:

	Number of Items	Chronbach's Alpha
Vocabulary	23	**0.86**
Phonological Awareness	17	**0.86**
Concepts about Print	10	0.76
Letter Identification	26	0.97
Word recognition and Sentences	20	0.93
Ideas about Maths	7	0.60
Counting and Numerosity	4	0.83
Simple Sums	8	0.83
Digit Identification	21	0.91
Shape Identification	5	0.62
Maths Problems	24	0.78
Reading[2]		**0.95**
Mathematics[3]		**0.93**

[2] Includes writing, concepts about print, letter identification, word recognition and sentences.

[3] Includes ideas about maths, counting and numerosity, simple sums, digit identification, shape identification and maths problems.

The reliability of some of the sub-scales is quite low because there are so few items in them, however the scales that form the main focus of this paper (vocabulary, reading, phonological awareness and mathematics) are high, reading and mathematics particularly so.

The PIPS-BLA recognises the importance of, and assesses, personal, social and emotional development, attitudes and behaviour although these are not analysed or discussed in this paper.

Sample

This study was restricted to children who completed the PIPS-BLA in the 2002-3 academic year and whose first language was English. Sample sizes for each country are indicated in Table 1.

INSERT TABLE 1 HERE

Schools use the PIPS-BLA with all children in a year-group and do not select or exclude particular sub-sets, such as children with special educational needs. The data from England and Scotland were representative of each country[4] but the Western Australia and New Zealand samples were not guaranteed to be representative of those countries as a whole. The schools in those two countries joined the PIPS project by choice and their national representativeness has yet to be demonstrated.

[4] In Scotland, a third of all education authorities chose to use the PIPS-BLA, which meant that all pupils starting school in those authorities were assessed. Therefore, the Scottish Secondary 4, 5 and 6 statutory assessments were compared against the country as a whole to confirm the representatives of the sample. The schools using the PIPS-BLA were not significantly different to the national norms. In England, the End of Key Stage 2 statutory assessments (conducted at the end of primary school) were used to confirm that the sample was nationally representative.

Analysis

Part 1: The Cognitive Profile of Children Starting School In Scotland

What do children know and what can they do when they start school in Scotland? Rasch measurement was used to estimate the relative difficulties of the items for the entire PIPS-BLA and for each section separately. Rasch measurement orders items on an equal interval scale which is measured in Logits. An everyday example of an equal interval scale is a ruler, which measures the length of objects in centimetres. However, unlike the measurement of length on a ruler, the Logit values are calculated using the probability of success or failure on each assessment item. (For further information about Rasch measurement see Bond and Fox, 2001.) A Logit value of 0 was chosen to represent the mean of the item difficulty estimates and the more positive the Logit value, the more difficult the item in relation to others in the assessment. The more negative the Logit value, the easier the item in relation to others in the assessment. A great advantage of Rasch measurement is that children can be placed on the same scale as the items and a distribution of their abilities plotted alongside the item difficulties.

Figure 1 gives an overview of the range of development of children on entry to school. It takes examples of items from each of the reading and phonological awareness, mathematics and vocabulary sections. Items are ordered from the most difficult (highest Logit value) to the easiest (lowest Logit value) and the distribution of pupils' scores is plotted alongside. Next to the Logit scale, the letter 'M' on the right side of the dividing line shows the position of the mean of the item difficulties and the 'M' on the left side of the dividing line shows mean of the pupil abilities. The Figure indicates that children of average ability are very likely to be able to: count to at least 7, identify all single digit numbers and name about half the letters. Technically, when a child's name appears opposite an item she or he has a 50:50 chance of getting the item right. The further child is above an item the greater the chance he or she has of being able to answer it correctly and vice versa.

INSERT FIGURE 1 HERE

How Does The Cognitive Profile Vary?

How does the cognitive profile vary by key factors? Data on age, gender, home background and pre-school experience were collected at the time of the PIPS-BLA and the analyses below show how the cognitive profile varies in relation to these variables. All results were significant at least at the 0.01 level unless otherwise stated.

Sex

Table 2 (Sex) indicates the advantage to girls over boys in standard deviation units (Effect Sizes[5]) for the four areas being considered.

INSERT TABLE 2 HERE

In general, the girls started school in Scotland a little ahead of the boys, although in mathematics there was no difference. The greatest difference between boys and girls was in the reading section where there was an advantage of about a fifth of a standard deviation. There was a similar but slightly smaller advantage in phonological awareness and in vocabulary there was just 0.06 of a standard deviation, which was statistically significant but educationally not important. It is worth pointing out also that the spread of scores for the girls was less than boys for both vocabulary and for mathematics, although not for phonological awareness or for reading. The implication of the standard deviation differences is that the girls form a more homogeneous group than the boys. Extreme scoring groups, the very highest and the very lowest, will have a greater preponderance of boys amongst them. For example, in the dataset considered here amongst those with the top 5% of scores for mathematics 64% were boys. In the bottom 5% the figure was 54% boys.

[5] The metric "effect size" is chosen because of its increasing use in educational research, its applicability across studies and the potential for its use in meta analyses.

Home Background

Home background has long been established as being an important variable when looking at children's performance at school, especially when no earlier cognitive measure is available. There is a variety of ways of looking at home background and a widely used measure in the UK is the entitlement to free school meals (FSM), which gives a dichotomous outcome. In the UK, children from families with a low financial income are entitled to receive a mid-day meal at school free of charge each day and therefore FSM is a crude indicator of the level of deprivation of a child. Table 3 shows the advantage to children without entitlement to free school meals over those with entitlement in standard deviation units (Effect Sizes) for the four areas being considered.

INSERT TABLE 3 HERE

Quite clearly in each of the 4 sections there were large differences between the average scores of pupils from the groups with and without entitlement to free school meals. This was most noticeable for reading and mathematics where the difference amounted to nearly 7/10 of a standard deviation and almost as much in vocabulary and rather less in phonics. It might be that it was rather less in phonological awareness because that part of the assessment only contained 17 items and was less reliable than the other measures. The overall general pattern averages out at about 7/10 of a standard deviation.

Pre-school Experience

INSERT TABLE 4 HERE

Contrary to expectations, the relationship between the amount of pre-school experience and PIPS-BLA scores was weak as shown in Table 4. The amount of pre-school experience recorded varied from 0 full-time terms to 6 and it was expected that a strong relationship would be found. On analysis, only a minimal link was found for mathematics (0.03 of a standard deviation unit per term). For a child attending pre-school for six terms the advantage was 0.18 standard deviation units, which is not of great educational importance. By comparison in England a very clear and uniform

relationship was found in the same year group amounting to typically around 0.1 standard deviation unit per term of attendance at pre-school. Figures 2 and 3 show a very strong and clear relationship between mathematics and the amount of pre-school in England but not for Scotland. The values on the Y-axis of Figures 2 and 3 are mean scores with error bars denoting the 95% confidence interval. To find such a weak relationship effect is a little odd and at this stage no clear explanation is apparent. The pre-school curriculum in Scotland focuses on learning through play and might emphasise the development of different skills to the curriculum in England, however, the Foundation Stage in England also places importance on child development, practical play and outdoor activity, and indeed Taylor Nelson Sofres and Aubrey (2002) found from a survey conducted in 2001 of head-teachers and teachers that that ethos was supported. Further qualitative research is necessary to explore the possible reasons for this finding..

INSERT FIGURE 2 HERE

INSERT FIGURE 3 HERE

Age

The Effect Sizes reported in Table 5 are the difference in scores between the youngest children (four and a half years old) and the oldest children (five and a half years old) starting school in Scotland. These are compared with children starting school in England (age four and five respectively) for each section of the PIPS-BLA.

INSERT TABLE 5 HERE

Clearly the age of children is of considerable importance in their cognitive development. To quantify the relationship between age and measured attainment, regression analyses were carried out to estimate the difference that a year makes. That is essentially the difference between youngest and the oldest children starting school in Scotland. Comparing the youngest with the oldest, the difference amounts to about half a standard deviation unit. The difference was slightly higher for mathematics, rising to two thirds of a standard deviation, and a little less for phonological awareness and vocabulary. Generally, the pattern can be translated into a figure of about 0.05 per month. There was a stronger relationship in England. That

is to be expected, at least to some extent, since the mean age of children starting school was lower than in Scotland and age is a more important factor for younger children than older.

Summary: What children know and can do when they start school in Scotland

In the first part of this analysis the PIPS-BLA was used to describe what children know and can do when they start school in Scotland. This was presented in charts derived from Rasch analyses. It showed a very large range of cognitive development. In the top 1% were fluent readers and children who were very adept at working with numbers and had extensive vocabularies. They could read passages which included words such as "everyone" and do problems such as "What is 3 fewer than 7?" In the lowest 1% were children whose progress towards literacy had reached the stage of recognising the activities of reading and writing without themselves having skills in those activities. They knew mathematically relevant words such as biggest and smallest but had difficulty counting just a few objects.

The age, sex and home background of the children showed systematic links to their developmental levels.

There was no difference between girls and boys in their average starting points for mathematics but older children and those from more affluent homes had higher starting points. The amount of pre-school experience was positively related to the starting point in mathematics, but to a very small extent. Important though age and home background were, they were small in comparison to the very large differences between pupils more generally. Similar results were found for vocabulary, reading and phonological awareness.

One surprising result was the very weak relationship found between the amount of pre-school experience and the PIPS-BLA scores at the start of compulsory education in Scotland.

Part 2: Do children starting school in England, New Zealand, Scotland and Western Australia have the same age related development profile?

In this section the starting points of children in England, New Zealand (NZ), Scotland and Western Australia (WA) are compared.

Before starting the comparative analyses, Rasch measurement was used to scale the items in the four sub-tests independently within each country. The relative difficulties of the items for the four countries were then compared. The purpose was to identify any items in the assessments that functioned differently between countries. The results showed very few differences. The strongest agreements were in mathematics, where the correlations of the difficulties of the items in the four countries were all 0.99. This is so high that no further preliminary action was needed before making comparisons.

The difficulties of the reading items were also strongly related but not quite so strongly. The correlations between countries for the reading, vocabulary and phonological awareness sections are shown in Tables 6, 7 and 8 respectively.

INSERT TABLE 6 HERE

The lowest correlation was for the items difficulties between Scotland and New Zealand but the figure (0.94) was felt to be sufficiently high to allow further analysis to proceed.

A similar analysis for the vocabulary items showed that two words were particularly difficult in the antipodes compared with the UK. They were pigeon and wasp and therefore these were excluded from further analysis. The correlations, excluding these items, are shown in Table 7.

INSERT TABLE 7 HERE

As with the reading correlations it was felt that the lowest figure (0.95) was sufficiently high to proceed with further analysis.

The phonological awareness section was less satisfactory as the correlations in Table 8 show.

INSERT TABLE 8 HERE

The correlations between the item difficulties for Scotland and the other countries might appear to be high for social science work but figures of 0.91 leave something to be desired as a basis for comparing countries and the correlations with Scottish data were the lowest in the table. Further, when the difficulties of specific items were compared it was not possible to pick out just one or two items as being problematic with a view to dropping them from the analysis. The point of this analysis was to ascertain if any items seemed to be culturally biased and relatively more easy or difficult for children in a particular country. The items in the phonological awareness section gave different outcomes for pupils in Scotland compared with pupils in England and New Zealand and as a result it was thought to be inappropriate to proceed with comparisons of that section.

For each of the three other sections (mathematics, reading and vocabulary) the datasets for Western Australia, New Zealand, England and Scotland were combined and then Rasch scales were created. The children were then put into eleven age categories corresponding to increments of 3 months each. The lowest had a mean age of 4.2 years and the highest of 6.6 years. The average scaled scores were then plotted against age to produce Figures 4, 5 and 6 below.

The first thing to notice from the figures is the difference in the age of children starting school in different countries. The pupils in England tend to be the youngest although there is some overlap with Scotland and New Zealand. The New Zealand sample is quite interesting in that all children start school immediately after their fifth birthday. The three charts show generally very similar patterns indicating that the cognitive growth patterns of children whose first language is English is similar in Scotland when compared with England, Western Australia and New Zealand. But, despite the general pattern, there were differences and these are examined in more detail below.

INSERT FIGURE 4 HERE

The vocabulary scores rise steadily with age and the four countries are very much in line with one another. There is suggestion that the vocabulary scores of the

younger children in Scotland are higher than similar children from England but this is just a suggestion.

INSERT FIGURE 5 HERE

The reading chart shows some clear differences from the vocabulary chart. The Scottish children now fall increasingly behind the children from the three other countries as the age increases. The English and Western Australian results form an unbroken continuum and the New Zealand scores are higher. The younger Scottish children are in line with the scores of children of the same age in England but for the oldest children there is a discrepancy of 0.38 standard deviation units (Effect Size) or about just over five months of development compared with similarly aged children in Western Australia.

INSERT FIGURE 6 HERE

The pattern for mathematics is very similar to the pattern for reading. The English and Western Australian children follow a continuum and the Scottish children show increasing discrepancies from Western Australia for older children. For the oldest group starting school in Scotland there is a discrepancy of about 0.31 standard deviation units (Effect size). This is equivalent to nearly four months of development. Unlike the reading data, the New Zealand results for mathematics are in line with the results for the other countries.

Further investigation

Factor analyses of the PIPS-BLA maths and reading scores suggested that those things which would be expected to be taught at school, such as word recognition, reading simple sentences and more formally presented maths problems, and which are usually not taught to children before the start of school form a different factor from those that are acquired more naturally (Tymms 1999). By developing 'more naturally' we mean that for areas such as vocabulary, a child is interacting with their environment and engaging in conversations with other children and adults. An understanding of the concepts of print is once again developed from interaction with adults and exposure to a range of literature. Other sections of the PIPS-BLA (Repeating Words, Rhyming Words, Ideas about Maths, Counting and Numerosity, Shape Identification, Addition and Subtraction problems presented without formal

notation, and Single Digit Identification) reflect areas that will develop as a consequence of a child's interactions with their environment, adults and other children. It was therefore hypothesised that the higher scores of older children outwith Scotland were the result of more formal teaching in the pre-school setting. This would fit with the findings reported in the PIRLS encyclopaedia (Mullis, Martin, Kennedy, and Flaherty, 2002) which compares pre-school curricular among the PIRLS countries. However, further analysis did not support this hypothesis. The most formal parts of the assessment (formal sums, the identification of numbers greater than nine and the reading of words, sentences and paragraphs) showed little difference between children from Scotland compared with those from the other countries, with the exception of the oldest children from Scotland who were a little behind the other countries. Further, the identification of single digit numbers, counting and simple informal sums were also more or less in line with the results for England and Western Australia, although once again the scores for Scotland were a little lower for older children.

But the greatest discrepancies were for Concepts about Print and letter identification. Children of all ages in Scotland were consistently lower than the other countries. Interestingly, Concepts about Print scores were particularly high for New Zealand, the country in which the work of Marie Clay, who pioneered Reading Recovery and invented the Concepts about Print scale, has been so important.

Summary: Comparison of the developmental profiles of children starting school in four English-speaking Countries

Scottish children start school at the age of 5 years on average. This is six months later than in England but the same as in New Zealand. In that country however, children start on or after their fifth birthday whereas in Scotland they generally start between the ages of 4.5 and 5.5. In Western Australia they start about six months later.

After taking age into account, the starting points of children in the four areas are very similar. However, older Scottish children appear to be behind in mathematics and early reading but not in vocabulary. It is not easy to come to clear conclusions as to why the data for Scotland should differ in some cases quite markedly from other countries. However, in Part 1 of the analysis it was noted that the relationship

between the outcome measures on the baseline assessment and pre-school experience was weak, and it could be that there is a connection here. It may be that the kind of pre-school provision being provided outside Scotland is different from the kind of provision provided within Scotland, but without further information about the pre-school curricula of the different countries it is difficult to draw any conclusions. It is also difficult to know exactly what the long-term consequences of the differences seen above are likely to be. However, the data do raise questions about possible differences between pre-school in Scotland and the other countries.

Concluding Comments

Funding from the Scottish Executive Education Department enabled the data from Scotland to be analysed in fine detail. This analysis raised some very interesting issues and also provided a template for the analysis of PIPS-BLA data from other countries should funds become available.

Research reports invariably call for more research and the call is heard so often that it can fall on deaf ears. But we believe that there are findings in this paper that urge further investigation. Two specific questions could profitably be addressed:

- Why is there such a weak link between the pre-school experience for children in Scotland and their starting points at school?
- Why do older children starting school in Scotland seem to be starting school at a lower level than children in other countries?

Such questions suggest qualitative work in the first instance, which would seek to explore differences between Scotland and other countries in the approach to pre-school. It would be important to link this to a review of the evidence base of pre-school practice.

In calling for this work we are aware that it may be taken as an implied criticism of current provision but this would be a misreading of our intentions. The research has thrown up some puzzling findings that need further investigation. We really do not know why we have found what we have found.

In addition to investigating aspects of cognitive development it would be interesting to look at the personal, social and emotional development of children in relation to age of starting school.

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Figure 1 Cognitive Profile of Children Starting School in Scotland

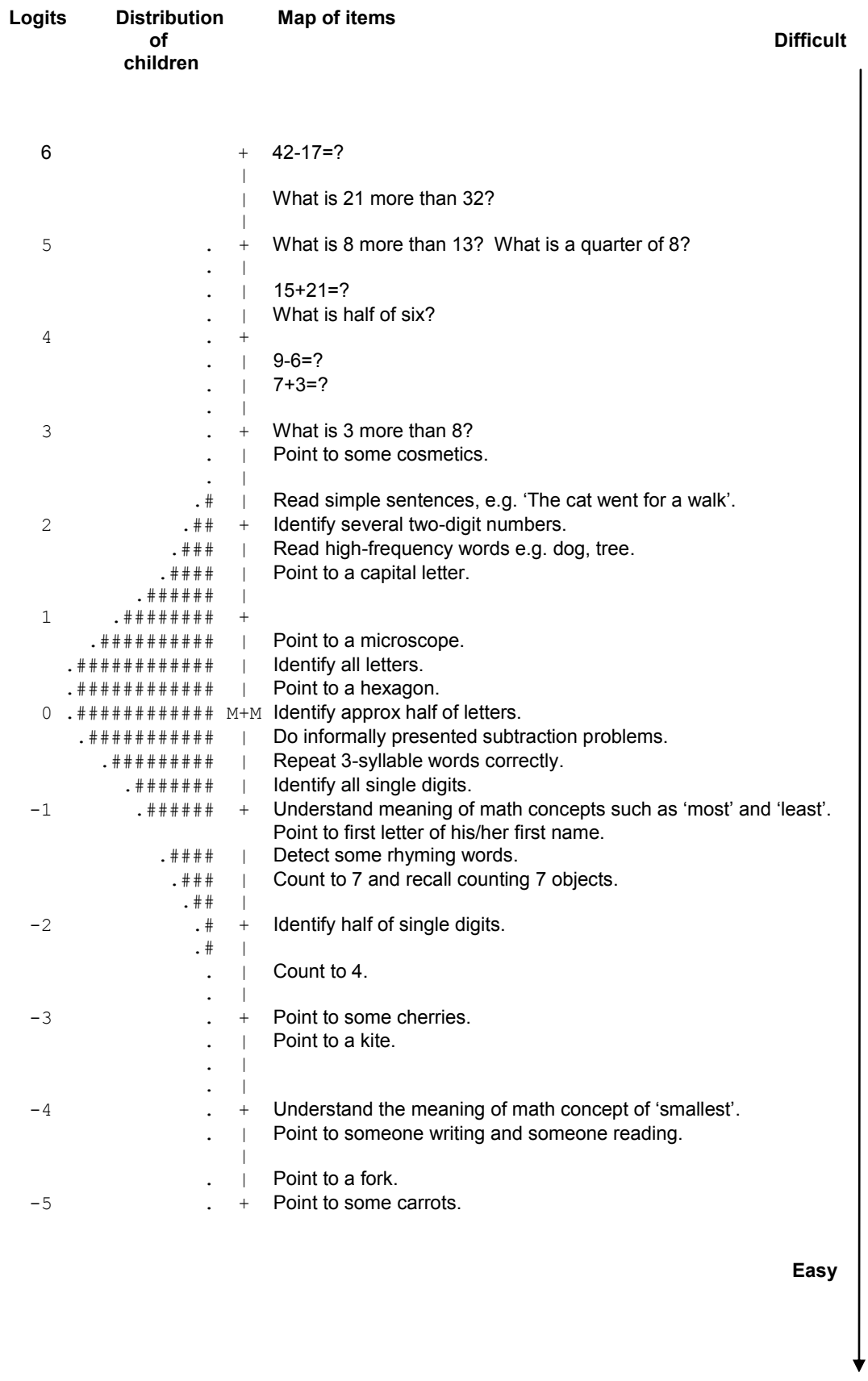

Table 1 Samples of children in 2003 whose first language was English

Country	Number of pupils
Scotland	8,652
England	65,258
Western Australia	10,630
New Zealand	5,870

Table 2 Sex

Section	Advantage to girls	SD boys	SD girls
Vocabulary	0.06	1.00	0.97
Phonological awareness	0.15	0.97	0.97
Reading	0.21	1.00	0.99
Mathematics	0.00*	1.05	0.95

* Not significant

Table 3 Home background

Section	Advantage to those without free meals	SD with FSM	SD no FSM
Vocabulary	0.62	0.99	0.97
Phonological awareness	0.45	1.01	0.96
Reading	0.69	0.97	0.98
Mathematics	0.68	1.04	0.99

Table 4 Pre-school experience

Section	Advantage for each term in pre-school	Comparative result from England
Vocabulary	0.01*	0.10**
Phonological awareness	0.01*	0.07**
Reading	0.01*	0.10**
Mathematics	0.03	0.11**

*Not significant

Table 5 Age

Section	Scotland Gain per year	England Gain per year
Vocabulary	0.41	0.66
Phonological awareness	0.34	0.68
Reading	0.56	0.85
Mathematics	0.66	0.98

Table 6 Correlation between difficulties of 56 reading items[6]

	WA	NZ	England
NZ	.99		
England	.97	.96	
Scotland	.96	.94	.99

Table 7 Correlation between difficulties of 17 vocabulary items[7]

	WA	NZ	England
NZ	.96		
England	.97	.96	
Scotland	.95	.96	.99

Table 8 Correlation between difficulties of 17 phonological awareness items[8]

	WA	NZ	England
NZ	.98		
England	.96	.98	
Scotland	.91	.91	.95

** Correlation is significant at the 0.01 level (2-tailed).

[6] A few infrequently presented items with large errors were omitted.

[7] A few infrequently presented items with large errors were omitted.

[8] A few infrequently presented items with large errors were omitted.

Figure 2 Mathematics and Terms in Pre-school in Scotland

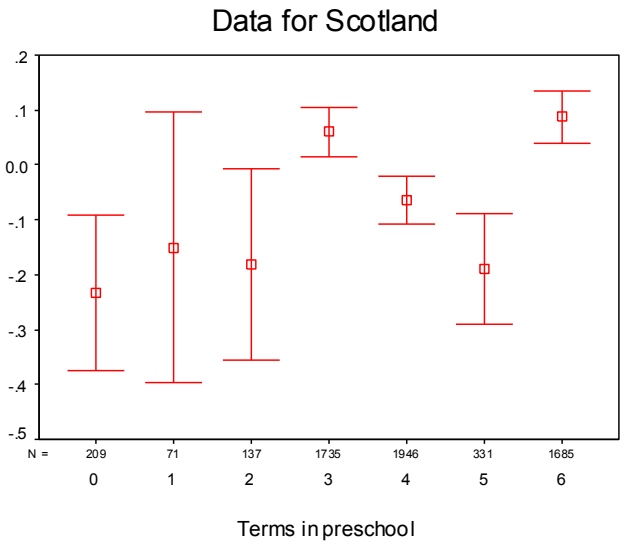

Figure 3 Mathematics and Terms in Pre-school in England

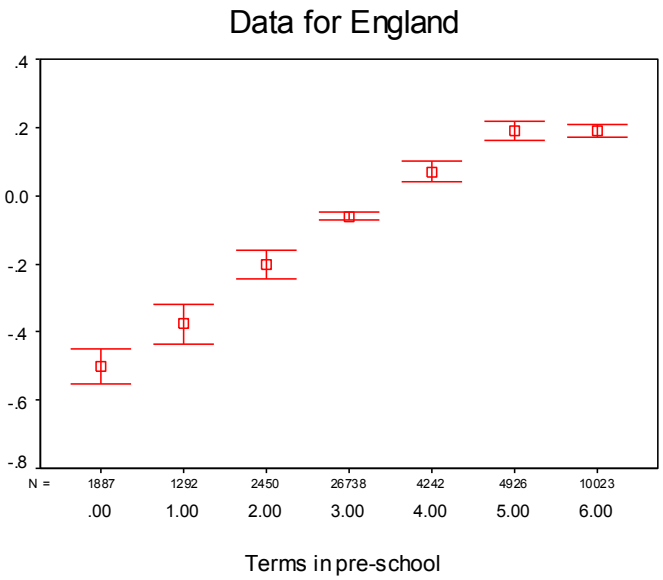

Figure 4 Vocabulary

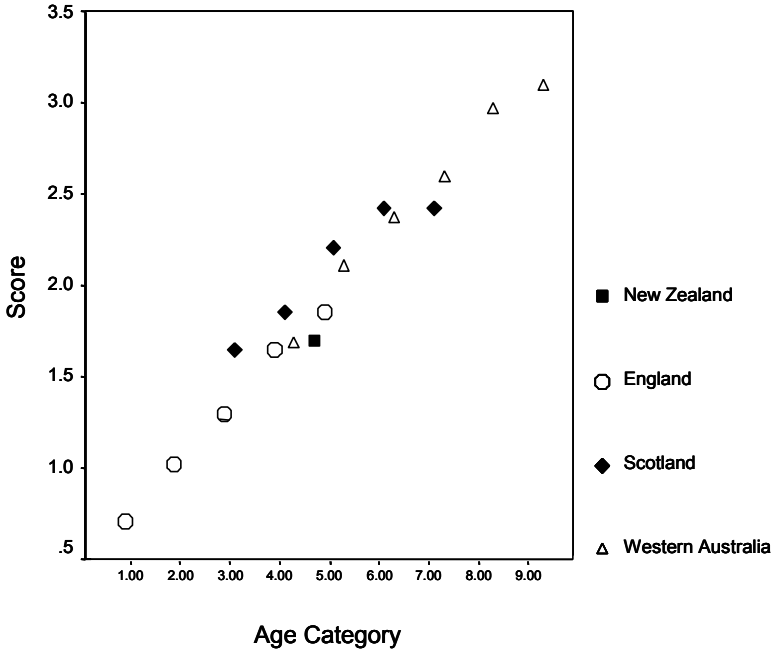

Figure 5 Reading

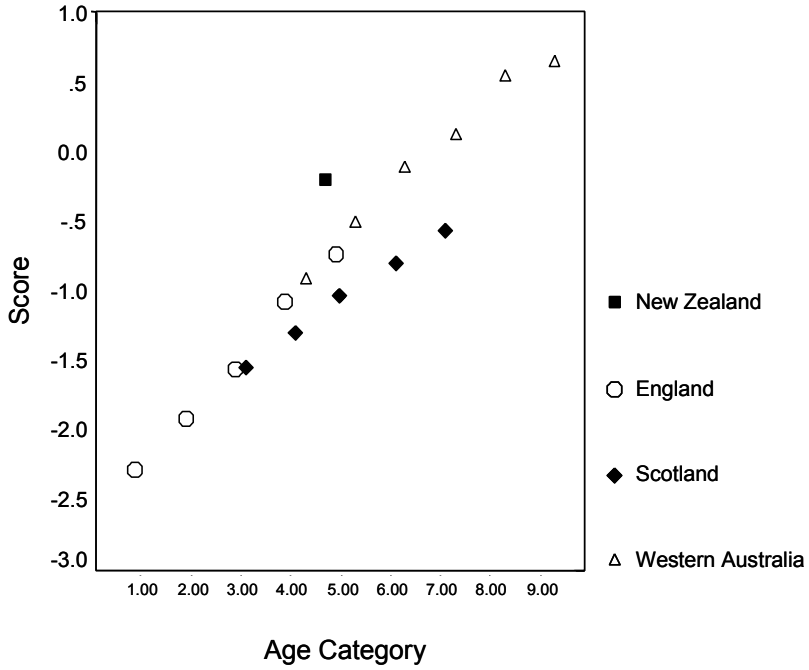

Figure 6 Mathematics